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14. ABSTRACT The sixth year of the MSRC included supporting a total of twenty-five MSRC funded projects, four postdoctoral pilot grants, and providing thirteen dissertation awards to expert and future leaders in the field of military suicide research. The Denver staff continues to collaborate with the Florida State University site and seek guidance from its senior advisors and the Military External Advisory Board. The MSRC was approved for a second one-year No Cost Extension. The MSRC has been approved for grant funding, to establish new research priorities and extend its scope.					
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Introduction:

The Military Suicide Research Consortium's ultimate goal is suicide prevention in the military, through research, including on primary, secondary, and tertiary interventions, as well as through information management/scientific communications (cataloguing and disseminating knowledge on military suicide). Specifically, suicidal personnel compromise force readiness, place a strain on the healthcare resources of the military, impact unit morale, and take a large emotional toll on the involved unit members, commanders, friends, and family. There is significant stigma associated with being suicidal, which limits the extent to which at-risk individuals are willing to seek help. Moreover, decision-makers need a go-to resource for accurate, efficient, and fast answers regarding suicidal behavior as policies and programs are developed. The Military Suicide Research Consortium is designed to facilitate information management/scientific communications for the DoD and to maximize research efforts at understanding and improving suicide risk screening and assessment, interventions, and population-level prevention programs, as well as to address other pressing research needs (e.g., basic research including neuroscientific and genetic approaches). Programs and projects conducted by the Consortium ensure that information management/scientific communications occur seamlessly, and that screening and assessment, intervention, and prevention efforts are based on the best possible scientific evidence, specific to military personnel. Further, the Consortium contributes to the goal of the research program by expanding our knowledge, understanding, and capacity to prevent, treat, and enhance the quality of life of persons in military communities and the general public who are affected by suicide-related problems.

The Consortium's overall mission can be summarized as follows; each function is developed with the goal of clear military relevance:

1. Produce new scientific knowledge about suicidal behavior in the military that will improve mental health outcomes for our men and women in uniform.
2. Use high quality research methods and analyses to address problems in policy and practice that will have a direct impact on suicide-related and other mental health outcomes for military personnel.
3. Disseminate Consortium knowledge, information, and findings through a variety of methods appropriate for decision makers, practitioners, and others who are accountable for ensuring the mental health of military personnel. This includes a rapid response function so that queries from decision makers and others to the Consortium are answered with speed and efficiency. Technical assistance and support for decision makers and others is an integral aspect of this Consortium function. This aspect of the Consortium warehouses knowledge about suicidal behavior in general (e.g., from civilian and international sources as well as from military sources), so that military issues can be informed in a comprehensive manner.
4. Train future leaders in military suicide research through experience within a multi-disciplinary setting for Ph.D. students and postdoctoral scholars interested in research questions on military suicide of both a basic and applied nature.

The inter-relations and flow of information between the Cores and the research program is an important component of the Consortium. By its nature, the Executive Management Core, Core A, is involved with all other Cores and the research program, to exert leadership and quality control over them. In its capacity as our knowledge warehouse/ communication center, the Information Management/Scientific Communications Core (Core B) receives input from all elements of the Consortium, and outputs information to military decision makers and others in rapid and efficient fashion. The Database Management/Statistical Core, Core C, represents a highly valuable asset to the Consortium as a whole, perhaps particularly to the research program. Core C provides world-class data management and analysis infrastructure and consulting.

Keywords:

Military, suicide, research, dissemination, prevention, intervention, assessment, training

Overall Project Summary:

Statement of Work

Task 1. Project Start-up (months 1-3) - Completed

- 1a. Create infrastructure for all Cores (month 1) - **Completed**
- 1b. Hire and train staff (month 2) - **Completed**
- 1c. Core B (Military/Civilian Research Monitoring research assistants) conduct first comprehensive literature review (month 3) - **Completed**

Task 2. Plan research projects (months 4-9) - Completed

- 2a. Establish research priorities in consultation with External Advisory Board (month 4) - **Completed**
- 2b. Assemble research teams (months 5-6) - **Completed**
- 2c. Continue creation of Core B infrastructure (months 4-9) - **Completed**
- 2d. Core A and Core B assist with protocol development and production (months 7-8) - **Completed**
- 2e. Core B review protocols to ensure proper military relevance (month 9) - **Completed**

Task 3. Implement intramural research projects (months 10-12) - Completed

- 3a. Preliminary study information submitted to Core B (month 12) - **Completed**
 - As of month 72, the MSRC Research Program has funded 25 research projects and 4 postdoctoral pilot grants. Seventeen research projects and all four postdoctoral pilot grants are successfully complete.

Task 4. Initial Consortium review by External Advisory Board (month 12) - Completed

Task 5. Preparing year one quarterly reports (months 3, 6, 9, 12) - Completed

Task 6. Continue intramural research projects (months 13-60) – In Progress

- Denver Research Institute funds 12 research projects:
 - *Usability and Utility of a Virtual Hope Box for Reducing Suicidal Ideation*, Dr. Nigel Bush, National Center for Telehealth and Technology/Portland VAMC, \$307,128 - **Completed March 2013**
 - *Psychophysiology of Suicidal States*, Drs. Michael Allen and Theresa Hernández, Denver VAMC, \$305,823 – **Closed October 2013**

- *Suicide Bereavement in Military and their Families*, Dr. Julie Cerel, University of Kentucky, \$672,989 – **Completed September 2014**
- *Suicide Risk Assessments within Suicide-Specific Group Therapy Treatment for Veterans: A Pilot Study*, Drs. Lori Johnson and David Jobes, Robley Rex VAMC, \$429,801 – **Completed June 2015**
- *Window to Hope: Evaluating a Psychological Treatment for Hopelessness among Veterans with TBI: A Phase II RCT and an Active Control Component*, Drs. Lisa Brenner and Grahame Simpson, Denver VAMC, \$986,789 – **Completed September 2015**
- *Effectiveness of a Virtual Hope Box Smartphone App in Enhancing Veteran's Coping with Suicidal Ideation: A Randomized Clinical Trial*, Dr. Nigel Bush, National Center for Telehealth and Technology/Portland VAMC, \$888,703 – **Completed April 2016** (Appendix 2)
- *A Behavioral Sleep Intervention for Suicidal Behaviors in Military Veterans: A Randomized Controlled Study*, Dr. Rebecca Bernert, Stanford University/Palo Alto VAMC, \$1,182,369 – **Completed September 2016** (Appendix 3)
- *Neuroimaging Correlates of Suicide*, Drs. Deborah Yurgelun-Todd and Perry Renshaw, University of Utah Brain Institute/Salt Lake City VAMC, \$755,096 – **Completed September 2016** (Appendix 4)
- *Toward a Gold Standard for Suicide Risk Assessment for Military Personnel*, Drs. Peter Gutierrez and Thomas Joiner, Denver VAMC/Florida State University, \$2,852,189 – **NCE through September 2017** (Appendix 5)
- *A Novel Approach to Identifying Behavioral and Neural Markers of Active Suicidal Ideation: Effects of Cognitive and Emotional Stress on Working Memory in OEF/OIF/OND Veterans*, Drs. Melissa Amick and Beeta Homaifar, Boston VAMC/Denver VAMC, \$648,313 – **NCE through September 2017** (Appendix 6)
- *Home-Based Mental Health Evaluation (HOME) to Assist Suicidal Veterans with the Transition from Inpatient to Outpatient Settings: A Multi-site Interventional Trial*, Dr. Bridget Matarazzo, Denver VAMC, \$1,516,055 – **NCE through September 2017** (Appendix 7)
- *Warning Signs for Suicide Attempts*, Drs. Courtney Bagge and Ken Conner, University of Mississippi Medical Center/University of Rochester Medical Center, \$2,322,993 – **NCE through September 2017** (Appendix 8)

Task 7. Establish pre-doctoral and postdoctoral training experiences at FSU and MIRECC (month 24) - Completed

- Pre-doctoral and postdoctoral training experiences were established at FSU and the Rocky Mountain MIRECC.
- The MSRC funded the following four **completed** postdoctoral pilot grants:
 - *Assessment of Cognitive Functioning as it relates to Risk for Suicide in Veterans with HIV/AIDS*, Dr. Gina Signoracci, Denver VAMC, \$47,454
 - *Behaviorally Assessing Suicide Risk*, Dr. Sean Barnes, Denver VAMC, \$46,328
 - *Romantic Relationship Satisfaction and Self-Directed Violence in Veterans*, Dr. Amanda Stoeckel, Salt Lake City VAMC, \$40,160

- *Longitudinal Assessment of Physical Activity and Suicide Risk*, Dr. Collin Davidson, Denver VAMC, \$46,665
- The MSRC funded the following annual Dissertation Completion Awards:
 - 2012 recipient:
Jessica Ribeiro, *Acute over-arousal and the acquired capability for suicide: Understanding acute suicide risk through the lens of the interpersonal theory of suicide*.
 - 2013 recipients:
Dan Capron, *Evaluation of a Cortisol-Augmented Interpretation Bias Modification for Anxiety Sensitivity on Suicidal Ideation*.
Alexis May, *Assessing Motivations for Suicide Attempts: Developing and Validating a Theoretically Driven Instrument*.
 - 2014 recipients:
Erin Poindexter, *An Experimental Manipulation of Acquired Capability in a sample of Combat Veterans: A Longitudinal Study*.
Caroline Silva, *Effects of a Burdensomeness Manipulation and the Capability for Suicide on a Proxy for Lethal Approach Behavior*.
Sarah Victor, *The Contributions of Affect, Cognition, and Life Experiences to Self-Directed Violence*.
 - 2015 recipients:
Kelly Zuromski, *Do Changes in Insomnia Precede Changes in Suicide Ideation?*
Carol Chu, *The Role of Oxytocin in Social Exclusion and Suicidal Behavior*
Christopher Hagan, *Hopelessness Regarding Thwarted Belonging and Perceived Burdensomeness*
Ashley Cole, *An Examination of Grit as a Moderator of the Relationship between Perceived Discrimination and Suicide Ideation*
Matthew Michaels, *Gender Norms, Sexual Orientation and Minority Stress*
Lauren Khazem, *Disability-related Factors and Perceived Stigma*
Courtney Golding, *Examining the Impact of Religion and Religiosity on the Coping of Suicide Survivors*.
- The MSRC holds an annual Pre-Conference Research Training Day for students and research fellows, with the purpose of developing pre-doctoral and postdoctoral students' and fellows' skills as military/Veteran suicide researchers. The Training Day has been held in conjunction with the American Association of Suicidology's Annual Conference (2013-2016). To date, a total of 113 students and fellows have participated in the workshop. Participants receive a \$1,000 stipend for travel costs. The aims are to educate advanced students and fellows in state-of-the-art research techniques, grant writing, research design, and regulatory issues. The faculty consistently reports the day to be productive, with 100% of the faculty interested in participating in future MSRC training days. Following training days, participants frequently correspond with potential collaborators, access national databases to answer research questions, write grant applications, and thirteen students subsequently earned an MSRC Dissertation Completion Award.
- Previous MSRC postdoctoral fellow, Mike Anestis, accepted a tenure-track position as an Assistant Professor in the Department of Psychology, at the University of Southern Mississippi and is a funded MSRC PI. In 2014, Dr. Anestis was awarded the Nina Bell Suggs Endowed Professorship, determined to have the greatest

potential for a junior faculty member to make a substantial contribution to his or her field of expertise.

- Jessica Ribeiro, MSRC postdoctoral fellow through Harvard University at Dr. Matthew Nock's lab, accepted an assistant professor position at Florida State University for fall 2016.
- Joseph Franklin, postdoctoral fellow supported through Dr. Matthew Nock's MSRC grant, accepted a tenure-track assistant professor position at Florida State University for fall of 2016.
- Previous MSRC postdoctoral fellow, Keith Jennings, is a Clinical Psychologist based at Fort Bragg, NC.

Task 8. Consortium review by External Advisory Board (month 24) - Completed

Task 9. Preparing year two quarterly reports (months 15, 18, 21, 24) - Completed

Task 10. Continue to refine research priorities (months 25-60) – In Progress

10a. Disseminate results in hand (month 27) – In Progress

- Drs. Bush, Cerel, Johnson, Schmidt, Signoracci, Barnes, Davidson, Bernert, Yurgelun-Todd, Brenner, and Stoeckel finished uploading their data to the Core C database for their completed studies.
- Drs. Amick and Homaifar, Matarazzo, Comtois, Bryan, Gutierrez and Joiner, Cogle, Anestis, Bagge and Conner, Nock, Li, and Keel are uploading data quarterly to Core C, after it is cleaned.
- Dr. Bush's Virtual Hope Box application press release occurred in May 2014 (month 44). The application is available for download and has been disseminated widely through DOD, T2, VA, and MSRC channels. Dr. Bush published on the VHB pilot within *Suicide and Life-Threatening Behavior* (month 52). Findings for the VHB RCT support continued dissemination efforts.
- Dr. Cerel and MSRC Senior Advisor, Ret. COL Castro, co-authored a white paper from the Military Suicide Bereavement study on promoting resilience following suicide exposure in military populations:
<https://msrc.fsu.edu/sites/msrc.fsu.edu/files//Military%2520Suicide%2520Exposure.pdf> (month 45). Dr. Cerel's findings are published in the *Journal of Affective Disorders* (month 47).
- Dr. Brenner and colleagues' publication on the cross-cultural adaptation of the Window to Hope (WtoH) intervention will encourage other research groups to explore the utility of this intervention in US and/or Veteran populations (month 48). Dr. Brenner and colleagues are finalizing a WtoH manual and a PST manual for wide-scale dissemination.
- Dr. Johnson and colleagues wrote a CAMS-G manual for dissemination. Suicide-specific group therapy for veterans, based on their study, was named a mental health best practice by VA leadership in their service network in November 2015. Since that time, 24 clinicians at 5 VA medical centers in Kentucky and Tennessee have been trained in the approach. There are plans in place to train additional clinicians at those sites in early 2017.

10b. Plan future projects (month 33-36) – In Progress

- The MSRC regularly communicates with DSPO, STARRS-LC, and the DOD on future collaborations.

Task 11. Consortium review by the MEAB (month 36) - Completed

Task 12. Preparing year three quarterly reports (months 27, 30, 33, 36) - Completed

Task 13. Consortium review by the MEAB (month 48) - Completed

Task 14. Preparing year four quarterly reports (months 39, 42, 45, 48) - Completed

Task 15. Consortium review by the External Advisory Board (month 60) - Completed

Task 16. Preparing year five quarterly reports (months 51, 54, 57, 60) - Completed

Task 17. Consortium review by the External Advisory Board (month 72) - Completed

- The Military External Advisory Board (MEAB) met with Core A in May 2016 (month 68).
- Drs. Gutierrez and Joiner presented to the MOMRP at the May 2016 In-Progress Review (IPR) meeting (month 68).
- The MSRC hosted its third annual IPR Meeting in July 2016 with MSRC Funded PIs and MOMRP, DCoE, and DSPO representatives in attendance, to review the projects' progress, challenges, and solutions (month 70).
- Core A reviews the progress of the Consortium with their senior advisors at annual meetings and on an as needed basis.

Task 18. Preparing year six quarterly reports (months 63, 66, 69, 72) - Completed

- The 1st and 2nd quarter reports were prepared and distributed on time.

Task 19. Consortium review by the External Advisory Board (month 84)

Task 20. Preparing year seven quarterly reports (months 75, 78, 81, 84)

Task 21. Preparing final project report (months 81-84)

Overall project timeline:

Year 1 — Complete Tasks 1, 2, 3, 4, and 5

- Tasks 1, 2, 3, 4, 5, and 7 were completed. Task 6 is ongoing.

Year 2 — Complete Tasks 7, 8, and 9. Task 6 is ongoing for the length of the grant

- Task 6 is ongoing. Tasks 7, 8, and 9 are completed. Task 10 was initiated.

Year 3 — Complete Tasks 10a, 10b, 11, and 12. Tasks 6 and 10 are ongoing for the length of grant.

- Tasks 6 and 10 are ongoing. Tasks 10a, 10b, 11 and 12 are completed.

Year 4 — Complete Tasks 13 and 14. Tasks 6 and 10 are ongoing for the length of the grant.

- Tasks 6 and 10 are ongoing. Tasks 13 and 14 are completed.

Year 5 — Complete Tasks 15 and 16. Tasks 6 and 10 are ongoing for the length of the grant.

- Tasks 6 and 10 are ongoing. Tasks 15 and 16 complete.

Year 6 — Complete Tasks 17 and 18. Tasks 6 and 10 are ongoing for the length of the grant.

- Tasks 6 and 10 are ongoing. Tasks 17 and 18 complete.

Key Research Accomplishments:

- With the advisory support of the ISPRP and MEAB, the MSRC funded twenty-five research projects and four postdoctoral pilot grants exploring suicide prevention, intervention, and postvention within active duty and Veteran populations.
- Authored 20 white papers at the request of MOMRP and other government entities.
- Dissemination and implementation for MSRC funded research is underway and influencing practice and policy. The VHB application and clinical guidelines have been released widely through the efforts of the DOD, T2, VA, and MSRC. The Window to Hope Intervention has been translated to meet the needs of a US Veteran population and policy recommendations from the Military Suicide Bereavement study were disseminated and available on the MSRC website. The pilot research from CAMS Groups provided evidence for continued research and clinician training.
- In addition to the 29 studies funded by the MSRC, the MSRC Common Data Elements were distributed to other researchers collecting data relevant to military suicide research.
- The MSRC estimates over \$15 million was leveraged to support research in line with the Consortium's mission.

Publications, Abstracts, and Presentations:

Data collection is underway or complete for all Denver subcontracted studies. Drs. Bush (pilot and RCT grants), Cerel, Brenner, Johnson, Bernert, and Yurgelun-Todd completed data collection and uploaded their measures to the MSRC Core C database. Drs. Gutierrez and Joiner, Homaifar and Amick, Matarazzo, and Bagge are actively recruiting for their studies.

Publications:

Davidson, C. L., Anestis, M. D., & Gutierrez, P. M. (2016). Ecological momentary assessment is a neglected methodology in suicidology. *Archives of suicide research*, 1-11.

ABSTRACT

Ecological momentary assessment (EMA) is a group of research methods that collect data frequently, in many contexts, and in real-world settings. EMA has been fairly neglected in suicidology. The current article provides an overview of EMA for suicidologists including definitions, data collection considerations, and different sampling strategies. Next, the benefits of EMA in suicidology (i.e., reduced recall bias, accurate tracking of fluctuating variables, testing assumptions of theories, use in interventions), participant safety considerations, and examples of published research that investigate self-directed violence variables using EMA are discussed. The article concludes with a summary and suggested direction for EMA research in suicidology with the particular aim to spur the increased use of this methodology among suicidologists.

Gutierrez, P. M. (2015). Introduction to the special section: The costs and benefits of working with pooled data. *Military Behavioral Health*. e-pub ahead of print. doi: 10.1080/21635781.2015.1085932

ABSTRACT

Five articles appear in a special section of this issue of the journal reporting analyses of data pooled from clinical trials funded by the Department of Defense on interventions for active-duty service members and veterans at risk of suicide. An overview of the studies contributing data and participant characteristics is provided. The rationale for pooling data along with the costs and benefits of such efforts is discussed. It is concluded that utilizing pooled data, in keeping with efforts being conducted by other large funders of clinical trials, is challenging but that the benefits outweigh the costs. The articles in the special section are useful for clinicians, researchers, and policymakers.

Gutierrez, P. M., Davidson, C., Friese, A., & Forster, J. (2016). Physical activity, suicide risk factors, and suicidal ideation in a veteran sample. *Suicide and Life-Threatening Behavior*, 46(3), 284-292. doi: 10.1111/sltb.1290

ABSTRACT

The association between current level of suicidal ideation and physical activity was tested in a broad sample of veterans seeking care from the Veterans Health Administration. It was hypothesized that the two variables would be significantly inversely related. It was further hypothesized that the relationship would be mediated by depressive symptoms, disturbed sleep, and a measure of heart rate variability based on existing research regarding physical activity and sleep. Due to the first hypothesis not being supported, the second could not be tested. Post hoc correlation analyses did find associations between physical activity and depressive symptoms, in expected directions, and are discussed. Possible explanations for the negative findings along with recommendations for future research to continue exploring links between suicide risk and physical activity are presented. We conclude by suggesting that physical activity may have promise as a risk reduction intervention and that prospective data are more likely to yield significant results than the cross-sectional methodology employed in the current study.

Hom, M. A., Stanley, I. H., Gutierrez, P. M., & Joiner, T. E. (2016). Exploring the association between exposure to suicide and suicide risk among military service members and veterans. *Journal of Affective Disorders*. doi:10.1016/j.jad.2016.09.043

ABSTRACT

Background: Past research suggests that suicide has a profound impact on surviving family members and friends; yet, little is known about experiences with suicide bereavement among military populations. This study aimed to characterize experiences with suicide exposure and their associations with lifetime and current psychiatric symptoms among military service members and veterans. Methods: A sample of 1753 United States military service members and veterans completed self-report questionnaires assessing experiences with suicide exposure, lifetime history of suicidal thoughts and behaviors, current suicidal symptoms, and perceived likelihood of making a future suicide attempt. Results: The majority of participants (57.3%) reported knowing someone who had died by suicide, and of these individuals, most (53.1%) reported having lost a friend to suicide. Chi-square tests, one-way ANOVAs, and logistic regression analyses revealed that those who reported knowing a suicide decedent were more likely to report more severe current suicidal symptoms and a history of suicidal thoughts and behaviors compared to those

who did not know a suicide decedent. Hierarchical linear regression analyses indicated that greater self-reported interpersonal closeness to a suicide decedent predicted greater self-reported likelihood of a future suicide attempt, even after controlling for current suicidal symptoms and prior suicidal thoughts and behaviors. Limitations: This study utilized cross-sectional data, and information regarding degree of exposure to suicide was not collected. Conclusions: Military personnel and veterans who have been bereaved by suicide may themselves be at elevated risk for suicidal thoughts and behaviors. Additional work is needed to delineate the relationship between these experiences.

Joiner, T. E., Hom, M. A., Rogers, M. L., Chu, C., Stanley, I. H., Wynn, G. H., & Gutierrez, P. M. (2016). Staring Down Death. *Crisis*. doi: 10.1027/0227-5910/a000367

ABSTRACT

Background: Lowered eye blink rate may be a clinically useful indicator of acute, imminent, and severe suicide risk. Diminished eye blink rates are often seen among individuals engaged in heightened concentration on a specific task that requires careful planning and attention. Indeed, overcoming one's biological instinct for survival through suicide necessitates premeditation and concentration; thus, a diminished eye blink rate may signal imminent suicidality. *Aims:* This article aims to spur research and clinical inquiry into the role of eye blinks as an indicator of acute suicide risk. *Method:* Literature relevant to the potential connection between eye blink rate and suicidality was reviewed and synthesized. *Results:* Anecdotal, cognitive, neurological, and conceptual support for the relationship between decreased blink rate and suicide risk is outlined. *Conclusion:* Given that eye blinks are a highly observable behavior, the potential clinical utility of using eye blink rate as a marker of suicide risk is immense. Research is warranted to explore the association between eye blink rate and acute suicide risk.

MSRC Funded PI Publications (Denver subawards)

MSRC funded PIs are submitting manuscripts regularly as studies are in their final stages:

Barnes, S. M., Bahraini, N. H., Forster, J. E., Stearns-Yoder, K. A., Hostetter, T. A., Smith, G., Nagamoto, H.T., & Nock, M.K. (2016). Moving Beyond Self-Report: Implicit Associations about Death/Life Prospectively Predict Suicidal Behavior among Veterans. *Suicide and life-threatening behavior*.

ABSTRACT

Reliance on self-report limits clinicians' ability to accurately predict suicidal behavior. In this study the predictive validity of an objective measure, the death/suicide Implicit Association Test (d/sIAT), was tested among psychiatrically hospitalized veterans. Following acute stabilization, 176 participants completed the d/sIAT and traditional suicide risk assessments. Participants had similar d/sIAT scores regardless of whether they had recently attempted suicide. However, d/sIAT scores significantly predicted suicide attempts during the 6-month follow-up above and beyond other known risk factors for suicidal behavior (OR = 1.89; 95% CI: 1.15–3.12; based on 1SD increase). The d/sIAT may augment the accuracy of suicide risk assessment.

Villatte, J. L., O'Connor, S. S., Leitner, R., Kerbrat, A. H., Johnson, L. L., & Gutierrez, P. M. (2015). Suicide attempt characteristics among veterans and active-duty service members receiving mental health services: A pooled data analysis. *Military behavioral health*, 3(4), 316-327.

ABSTRACT

Past suicidal behaviors are among the strongest and most consistent predictors of eventual suicide and may be particularly salient in military suicide. The current study compared characteristics of suicide attempts in veterans ($N = 746$) and active-duty service members ($N = 1,013$) receiving treatment for acute suicide risk. Baseline data from six randomized controlled trials were pooled and analyzed using robust regression. Service members had greater odds of having attempted suicide relative to veterans, though there were no differences in number of attempts made. Service members also had higher rates of premilitary suicide attempts and nonsuicidal self-injury (NSSI). Veterans disproportionately attempted suicide by means of overdose. In veterans, combat deployment was associated with lower odds of lifetime suicide attempt, while history of NSSI was associated with greater attempt odds. Neither was significantly associated with lifetime suicide attempt in service members. Implications for suicide assessment and treatment are discussed.

Presentations:

In FY2016, MSRC staff and Funded PIs presented at 7 conferences, giving 24 presentations in total.

Below are references for a number of the conference presentations from Denver funded PIs and staff:

- Brenner LA, Barnes S, Monteith L, Homaifar B, Gerard G, Hoffberg A, Simpson G. (2016, March). Evaluating the acceptability and feasibility of problem solving therapy for suicide prevention among Veterans with moderate to severe TBI. 11th World Congress on Brain Injury. The Hague, Netherlands.
- Brenner LA, Simpson G, Hoffberg A, Matarazzo B, Signoracci G, Forster J. (2016, March). Window to Hope cognitive behavioral group therapy among US Veterans with Traumatic Brain Injury: results from an efficacy trial. 11th World Congress on Brain Injury. The Hague, Netherlands.
- Bush NE, Armstrong C, Blasko K, Cooper D, Pruitt L. Panel and presentations. (2016, April). Mobile and Personal Technologies for Military Mental Health. International Society for Research on Internet interventions (ISRII) annual conference. Seattle, WA.
- Bush NE, Dobscha SK. (2016, March) Effectiveness of the Virtual Hope Box smartphone application for emotion regulation and stress reduction: results from a randomized controlled clinical trial of veterans with suicidal ideation. American Association of Suicidology Annual Meeting. Chicago IL.
- Bush NE, Armstrong C, Stewart A. (2015, December) Using Technology in Behavioral Health Care. Naval Medical Center, San Diego, CA
- Dobscha SK, & Bush NE. (2015, October). Preliminary Results from a Randomized Clinical Trial of a Smartphone Application for Veterans with Suicidal Ideation. VA National Suicide Prevention Cyberseminar.

- Gutierrez, P. M., & Joiner, T. (2016, August). The Military Suicide Research Consortium Common Data Elements: Psychometric Support, Clinical, and Research Utility. Presented at the Military Health System Research Symposium, Kissimmee, FL.
- Gutierrez, P. M., Pease, J., Matarazzo, B., Monteith, L., & Hernandez, T. (2015, October). How well do the Interpersonal Needs Questionnaire and the Acquired Capability for Suicide Scales work for military veterans? Presented at the IASR/AFSP International Summit on Suicide Research, New York, NY.
- Hanson, J.E., Soberay, K.A., Dwyer, M.M., Gutierrez, P.M., & Plant, A. (2016, March). *Understanding the relationship of TBI, severe insomnia, and suicidal behaviors in active duty, veteran, and civilian populations*. Poster presentation at the 49th annual conference of the American Association of Suicidology. Chicago, IL.
- Matarazzo, B.B. (2016, August). The HOME Program: Supporting Veterans at Risk for Suicide with the Post-Hospitalization Transition. Invited oral presentation for the Division 19 (Military Psychology) Hospitality Suite at the 2016 American Psychological Association Convention, Denver, CO.
- Soberay, K. A., Dwyer, M. M., Hanson, J. E., Spinks, J., Soberay, A., & Gutierrez, P. M. (2016, March). The dissemination of military research understood through Altmetrics. Poster presentation at the 49th annual conference of the American Association of Suicidology. Chicago, IL.
- Villatte, J. L., O'Connor, S., Leitner, R., Kerbrat, A. H., Johnson, L. A., & Gutierrez, P. M. (2015, October). Differences in Risk Factors and Characteristics of Suicide Attempts between Active Duty Military Personnel and Veterans. Presented at the IASR/AFSP International Summit on Suicide Research, New York, NY.

Reportable Outcomes

The following are outcomes that have resulted from this research as it relates to a product, scientific advance, or research tool that makes a meaningful contribution toward the understanding, prevention, diagnosis, prognosis, treatment and/or rehabilitation, injury or condition, or to improve quality of life:

- Virtual Hope Box mobile application, Clinician's Guide, and User's guide: <http://t2health.dcoe.mil/apps/virtual-hope-box>
 - Downloaded more than 150,000 times and has received an unprecedented flood of positive endorsements from downloaders (308 positive vs 21 negative comments in 2015), and testimonials of benefit from providers and patients.
 - The VHB has been downloaded by users in more than a dozen countries across Asia, the Pacific, Europe, Canada, Africa, the Middle East, India, Latin America and the Caribbean, as well as within the USA.
 - The VHB is now used as a key component of the national provider training program "Using Technology in Behavioral Health Care" conducted with military and VA providers by the National Center for Telehealth and Technology.
 - The VHB was selected in 2016 for the first pilot test of The Defense Centers of Excellence for Psychological Health and TBI new knowledge translation (KT) program.
 - Numerous media features including interview with Irish Times.

- VHB Promotional video made by Army Medicine Performance Triad:
<https://www.youtube.com/watch?v=vCe12gUa878&list=PL3evLnVMtkRScloQ1mKyFMKpnlvLxJl7yt&index=1Video>.
- The Window to Hope Program Manual – US Military Veterans. Clinician and Participant Versions: Available by request from Dr. Lisa Brenner
- Problem Solving for Veterans Manual. Clinician and Participant Versions: Available by request from Dr. Lisa Brenner
- CAMS Group Manual: Available by request from Drs. Lori Johnson and Peter Gutierrez
 - To date, the CAMS Group Manual was used to train 24 clinicians at 5 VA Medical Centers within VISN 9.

Expected products:

Home-Based Mental Health Evaluation (HOME) Clinician and Participant Manuals
 Warning Signs for Suicide Attempts

Other Achievements

Within FY 2016, the MSRC responded to 4 media inquiries, addressed 7 research information requests and referred 2 researchers to the BAA.

In an effort to take advantage of leveraging funds, this is a reoccurring agenda item on the bi-monthly conference calls and requested on quarterly reports from funded investigators. The MSRC collaborates in leveraging funds that include an increase of grant funds, time, and infrastructure support. Below are some of the most noteworthy leveraging funds efforts:

Grant/Awards			
Principal Investigator	Grant/Award	MSRC support	Monetary Value
Ron Acierno	Omega-3 & Suicide Prevention	Consultation & inclusion of MSRC Common Data Elements	\$10,000,000
Lisa Brenner	Active Control Component WtoH	Funding an additional active control component to MSRC funded study	\$112,469.79
Rebecca Bernert	NIMH K Award	Recipient of award after MSRC funding - covers salary of MSRC funded project	\$100,000
Jennifer Hames	John Templeton Foundation	FSU Graduate Student, MSRC staff Received grant to test the Efficacy of a Gratitude Intervention in Individuals at Risk for Suicide and Depression	\$10,000
Jesse Cogle	CRC planning grant	Launch a new idea from anger research, to start a larger clinical application	\$13,000
Jesse Cogle	National Institute of Drug Abuse	Launch a new idea from MSRC anger research	\$690,000

Brad Schmidt	AFSP DIG-0-030-12	Further developing MSRC funded cognitive anxiety research	\$100,000
Dan Capron	NIH grant	Further developing MSRC cognitive anxiety intervention	\$68,012
Lindsay Bodell	NIH clinical training grant	FSU Graduate Student, MSRC staff	\$78,819
Deborah Yurgelun-Todd	State of Utah provided funding for neuroimaging equipment	Successes of MSRC funded study led to the state providing upgraded imaging equipment	\$3,000,000
Caroline Silva	McKnight Dissertation Award	FSU Graduate Student, MSRC staff	\$1,200
Bridget Matarazzo	Expansion of HOME Clinical Demonstration Project to additional sites (Seattle and Raleigh-Durham) and continue the project in Salt Lake City	The expansion of HOME serves as a nice compliment to the work of the HOME MSRC grant	\$461,727
Bridget Matarazzo	Expansion of HOME Clinical Demonstration Project to accommodate the needs of rural Veterans in North Carolina (Durham)	The expansion of the HOME Clinical Demonstration Project serves as support of the overall intervention studied	\$285,554
Leah Shelef Peter Gutierrez Thomas Joiner	Israel Defense Forces	The Gold Standard Study and Israel Defense Forces are collecting the same suicide measures within their military populations to explore international differences at completion	\$10,500
Gina Signoracci Sean Barnes Amanda Stoeckel Collin Davidson	MIRECC Postdoctoral Pilot Grants	The MSRC funded postdoctoral pilot projects, with their salaries absorbed by the Rocky Mountain MIRECC	\$248,000
Kelly Soberay	Colorado Brain Injury Program Education Grant	MSRC Staff	\$7,000
Ian Stanley Melanie Hom	Violet and Cyril Franks Scholarship, American Psychological Foundation	Modifying Help-Seeking Stigma: Development and Prospective Evaluation of a Novel Cognitive Bias Modification Intervention	\$5,000
Sean Barnes	Cognitive Anxiety Sensitivity for Veterans	Leveraged from Dr. Schmidt's MSRC funded CAST study	\$34,794
TOTAL			\$15,226,076

Consultation		
Contact / Organization	Project	MSRC support
Army STARRS	Collaboration on military suicide prevention and intervention research grant ideas	Drs. Gutierrez and Joiner regularly share ideas and resources with the Army STARRS PIs, as well as discuss their epidemiological findings and recommendations for MSRC prevention and intervention research
Colorado Office of Suicide Prevention & Injury Control Center Research & DSPO	Means Restriction Program Evaluation	Dr. Gutierrez was consulted for this effort, which expanded in 2016 with another project at Ft. Carson on Means Safety
Colorado Office of Suicide Prevention	Public Health Campaign targeting working age men	Dr. Gutierrez was consulted for this effort
Colorado Office of Suicide Prevention	ManTherapy.org, including international expansion and CDC grant application	Drs. Joiner and Gutierrez are on-going consultants for these efforts
Florida State University	FSU initiative to connect student Veterans to National Science Foundation Grant	Drs. Joiner and Gutierrez were consulted for this effort
Defense Centers of Excellence	DCoE's Screening & Assessment Tools for Suicide Prevention Guide	Dr. Gutierrez reviewed and provided consultation for the 61 page resource
MOMRP	Response letter for general inquires	Dr. Gutierrez provided general response letter on funding and other research inquires to free time for the MOMRP staff
Defense Suicide Prevention Office (DSPO)	Suicide screening and assessment project	Dr. Gutierrez reviewed DSPO's suicide screening and assessment recommendations; provides on-going consultation
DOD VA	VA/DOD Clinical Practice Guidelines for Suicide Prevention	Drs. Joiner and Gutierrez and Dr. Castro (Ret. COL), provided written input for the guidelines
House of Representatives	Questions on IED, TBI, and Suicide	Drs. Joiner and Gutierrez advised the House of Representatives on their questions and will either develop a proposal or designate a research team to explore this topic
MOMRP Suicide Portfolio Manager	Department of Defense study on Predictive Analytics for Suicide Risk	Dr. Joiner provided information regarding the application of these techniques to suicide risk
MOMRP Suicide Portfolio Manager	Hyperbaric Oxygen Therapy (HBOT)	Dr. Joiner provided information on HBOT
All MSRC funded PIs	All MSRC funded studies	The MSRC hosts a quarterly PI call and annual In-Progress Review meeting for the funded PIs to benefit from each other's knowledge and research experience
Danish Defense and Veterans Departments	Danish soldiers' reintegration problems	Drs. Joiner and Gutierrez provided their expertise on military suicide to Dr. Trine Madsen. Discussions continue on future international collaborations

Centers for Disease Control and Prevention (CDC)	Meeting on preventing prescription overdoses in middle-age men, MSRC briefing	Dr. Gutierrez briefed representatives on the MSRC and its research portfolio
National Fallen Firefighter Foundation	Prevention of suicide in firefighters	Dr. Joiner provided consultation on the prevalence of suicide ideation and death rates in firefighters
Portland VAMC	Systematic review on suicide assessment measures	Dr. Gutierrez is a technical expert for the systematic review
Big White Wall: UK Ministry of Defence, Help for Heroes, UK Department of Health, & Armed Forces Covenant	Delivering better mental health and emotional resilience for the UK Armed Forces Community	Dr. Joiner provided consultation to the Big White Wall group
Israel Defense Forces/ Shores Meeting	U.S. and Israeli Medical researchers collaborate	Dr. Gutierrez participated in the collaborative Shores meeting with US and Israeli researchers, presenting on the MSRC and Toward a Gold Standard research Following the 2015 Shores Meeting, Dr. Gutierrez started discussions to prepare grant proposals, combining expertise of US (Drs. Gutierrez and Joiner) and Israeli suicide researchers
SAMHSA	Suicide Intervention and Prevention Proposal	Dr. Joiner reviewed a SAMHSA proposal on suicide intervention and prevention that includes infrastructure similar to the MSRC. Using his expertise as a MSRC Director, he provided feedback to SAMHSA
University of Maryland	Online Screening and Early Intervention to Prevent Suicide among Middle-Aged Men	Dr. Joiner is a consultant on a grant through the University of Maryland
Dr. Brad Schmidt	Dr. Schmidt's CAST study is being translated into German and Spanish	The research of CAST was supported by MSRC funds

MSRC Common Data Elements

Contact / Organization	Project	MSRC support
Dr. Bob Heinssen	NIH Grants	NIH is interested in adding the MSRC Common Data Elements to future studies
Dr. Jane Pearson	NIMH Grants	NIMH is interested in leveraging the MSRC Common Data Elements to make use of existing data sets to explore questions of treatment effectiveness
NIMH	PhenX Suicide-specific Toolkit	Dr. Gutierrez served on the PhenX workgroup to develop the toolkit, which is available to NIMH funded PIs.

Conclusion:

The Military Suicide Research Consortium reached its annual goals and research aims. Denver Research Institute has funded twelve research projects and four postdoctoral research pilot grants. Florida State University has funded thirteen research teams. The three Cores collaborate on a daily basis, working toward the ultimate goals of suicide prevention in the military and information dissemination to decision makers, practitioners, and others who are accountable for ensuring the mental health of military personnel.

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Appendices:

A1. Peter Gutierrez, Ph.D. CV	Appendix Pages: 19-35
A2. <i>Effectiveness of a Virtual Hope Box Smartphone App in Enhancing Veteran's Coping with Suicidal Ideation: A Randomized Clinical Trial</i> , Dr. Nigel Bush, National Center for Telehealth and Technology/Portland VAMC	Appendix Pages: 36-38
A3. <i>A Behavioral Sleep Intervention for Suicidal Behaviors in Military Veterans: A Randomized Controlled Study</i> , Dr. Rebecca Bernert, Stanford University	Appendix Pages: 39-41
A4. <i>Neuroimaging Correlates of Suicide</i> , Drs. Deborah Yurgelun-Todd and Perry Renshaw, University of Utah Brain Institute/Salt Lake City VAMC	Appendix Pages: 42-46
A5. <i>Toward a Gold Standard for Suicide Risk Assessment for Military Personnel</i> , Drs. Peter Gutierrez & Thomas Joiner, Denver VAMC/FSU	Appendix Pages: 47
A6. <i>A Novel Approach to Identifying Behavioral and Neural Markers of Active Suicidal Ideation: Effects of Cognitive and Emotional Stress on Working Memory in OEF/OIF/OND Veterans</i> , Drs. Melissa Amick and Beeta Homaifar, Boston VAMC/Denver VAMC	Appendix Pages: 48
A7. <i>Home-Based Mental Health Evaluation (HOME) to Assist Suicidal Veterans with the Transition from Inpatient to Outpatient Settings: A Multi-site Interventional Trial</i> , Dr. Bridget Matarazzo, Denver VAMC	Appendix Pages: 49-50
A8. <i>Warning Signs for Suicide Attempts</i> , Drs. Courtney Bagge and Ken Conner, University of Mississippi Medical Center/University of Rochester Medical Center	Appendix Pages: 51-52
A9. Barnes et al. (2016) Full Article	Appendix Pages: 53-63
A10. Davidson et al. (2016) Full Article	Appendix Pages: 64-75
A11. Gutierrez (2015) Full Article	Appendix Pages: 76-82
A12. Gutierrez et al. (2016) Full Article	Appendix Pages: 83-91
A13. Hom et al. (2016) Full Article	Appendix Pages: 92-100
A14. Joiner et al. (2016) Full Article	Appendix Pages: 101-106
A15. Villatte et al. (2015) Full Article	Appendix Pages: 107-127
A16. MSRC Quad Charts	Appendix Pages: 128-134

A1**VITA**

DATE: 10-17-16
NAME: Peter M. Gutierrez

EDUCATION:

<u>Degree</u>	<u>Date</u>	<u>Institution</u>	<u>Location</u>
Ph.D., Clinical Psychology	1997	University of Michigan	Ann Arbor, MI
M.A., Clinical Psychology	1994	University of Michigan	Ann Arbor, MI
B.A., Psychology	1991	Winona State University	Winona, MN

Summa Cum Laude

AREAS OF SPECIALIZATION AND RESEARCH INTERESTS:

Suicide risk factors, assessment, and interventions. Scale development and psychometric evaluation.

PROFESSIONAL EXPERIENCE:

2008- Clinical/ Research Psychologist, Department of Veterans Affairs, Rocky Mountain Mental Illness Research and Education Clinical Center.

6/9/08- Licensed Clinical Psychologist, Colorado #3203.

7/1/14- Professor, University of Colorado School of Medicine, Department of Psychiatry.

2009-2014 Associate Professor, University of Colorado School of Medicine, Department of Psychiatry.

2008-2009 Visiting Associate Professor, University of Colorado Denver School of Medicine, Department of Psychiatry.

2007-2008 Research Psychologist, Denver VA Medical Center, Mental Illness Research and Education Clinical Center.

2006-2008 Adjoint Associate Professor, University of Colorado Denver School of Medicine, Department of Psychiatry.

2006-2007 Research Consultant, Denver VA Medical Center, Mental Illness Research and Education Clinical Center.

2002-2007 Associate Professor, Northern Illinois University, Department of Psychology.

2002-2006 Assistant Chair, Northern Illinois University, Department of Psychology.

1996-2002 Assistant Professor, Northern Illinois University, Department of Psychology.

1995-1996 University of Michigan, University Center for the Child and Family, Psychology Intern (APA Accredited through University's Captive Consortium).

1993-1995 University of Michigan Medical Center, Division of Child and Adolescent Psychiatry, Department of Psychiatry, Psychology Intern (APA Accredited through University's Captive Consortium).

PUBLICATIONS (95): <http://www.ncbi.nlm.nih.gov/sites/myncbi/1NSkUvt-678QZ/bibliography/48519024/public/?sort=date&direction=ascending>

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BOOK/CHAPTERS (8):

- Jobes, D. A., Comtois, K. A., Brenner, L. A., Gutierrez, P. M., & O'Connor, S. S. (in press). Lessons learned from clinical trials of the Collaborative Assessment and Management of Suicidality (CAMS). In R. O'Connor, S. Platt, & J. Gordon (Eds.), *International handbook of suicide prevention: Research, policy, and practice*, 2nd Edition. West Sussex, UK: Wiley-Blackwell.
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PAPER PRESENTATIONS (71):

- Gutierrez, P. M., & Joiner, T. (2016, August). The Military Suicide Research Consortium Common Data Elements: Psychometric Support, Clinical, and Research Utility. Presented at the Military Health System Research Symposium, Kissimmee, FL.
- Gutierrez, P. M. (2016, April). The Interpersonal Needs Questionnaire and Acquired Capability for Suicide Scale: Valid and Reliable Measures for use with Veterans. In M. VanSickle (Chair), *Measures*. Presented at the 49th Annual Conference of the American Association of Suicidology, Chicago, IL.
- O'Connor, S. S., Jobes, D. A., Gutierrez, P. M., Johnson, L. L., Jennings, K. A., & Carney, E. (2016, April). Applying Mediational and Qualitative Methods to Advance our Understanding of Suicidal ideation in Distinct Clinical Populations. Presented at the 49th Annual American Association of Suicidology conference, Chicago, IL.
- Gutierrez, P. M., Pease, J., Matarazzo, B., Monteith, L., & Hernandez, T. How well do the Interpersonal Needs Questionnaire and the Acquired Capability for Suicide Scales work for military veterans? Presented at the IASR/AFSP International Summit on Suicide Research, New York, NY, October 14, 2015.
- Villatte, J. L., O'Connor, S., Leitner, R., Kerbrat, A. H., Johnson, L. A., & Gutierrez, P. M. Differences in Risk Factors and Characteristics of Suicide Attempts between Active Duty Military Personnel and Veterans. Presented at the IASR/AFSP International Summit on Suicide Research, New York, NY, October 12, 2015.
- Gutierrez, P. M., & Joiner, T. The Military Suicide Research Consortium: Clinical trials reducing suicide risk and increasing resilience. Presented at the Military Health Systems Research Symposium, Fort Lauderdale, FL, August 19, 2015.
- Gutierrez, P. M. Advances in understanding suicide in the US military. Presented at the International Association for Suicide Prevention conference, Montreal, QC, Canada, June 18, 2015.
- Cornette, M., Wintersteen, M., Gutierrez, P. M., Reidenberg, D., & McKeon, R. Youth warning signs for suicide: Results of a national expert consensus panel. Presented at the American Association of Suicidology annual conference, Atlanta, GA, April 17, 2015.
- Crowley, K. J., Tucker, R., Davidson, C., & Gutierrez, P. M. Connecting over what "drives" suicide: Defining suicide-specific drivers and their utility for clinical risk. Presented at the American Association of Suicidology annual conference, Atlanta, GA, April 17, 2015.
- Anestis, M., Bradley, B., Cornette, M., Denneson, L., & Gutierrez, P. M. On the front lines of military suicidology. Presented at the American Association of Suicidology annual conference, Atlanta, GA, April 17, 2015.

- Crowley, K. J., Ballard, E., Tucker, R., Davidson, C., May, A. E., Klonsky, E. D., & Gutierrez, P. M. Improving imminent risk assessment: Conceptual and empirical considerations. Presented at the American Association of Suicidology annual conference, Atlanta, GA, April 16, 2015.
- Gutierrez, P. M., & Shelef, L. (2015, March). Predictive Validity of Suicide-specific Measures. Shoresh military medicine conference, Ramat Gan, Israel.
- Gutierrez, P. M., & Joiner, T. (2015, March). Military Suicide Research Consortium Treatment Studies. Shoresh military medicine conference, Ramat Gan, Israel.
- Gutierrez, P. M. Veteran suicide risk assessment. Grand Rounds presentation at the University of Mississippi Medical Center, Department of Psychiatry and Human Behavior, Jackson, MS, September 5, 2014.
- Gutierrez, P. M. Veteran suicide risk assessment. Presented at the American Psychological Association convention, Washington, DC, August 8, 2014.
- Gutierrez, P. M. Is alcohol use really a direct risk factor for suicide? Presented at the Show Me You Care About Suicide Prevention Conference, Jefferson City, MO, July 15, 2014.
- Gutierrez, P. M. Providing for our youngest Veterans: Similarities and Differences in College Student and Veteran Suicide Prevention Efforts. Presented at the Preventing Suicide Among Youth and Young Adults conference, Springfield, IL, April 25, 2014.
- Chesin, M. S., Hughes, J., Andover, P., & Gutierrez, P. M. Developing and testing three novel adjunctive psychosocial interventions to prevent suicide and non-suicidal self-injury: An overview of the interventions, lessons learned, and preliminary outcomes. Presented at the American Association of Suicidology conference, Los Angeles, CA, April 10, 2014.
- O'Connor, S. S., Villatte, J., & Gutierrez, P. M. Differences in characteristics of suicide attempts between active duty military personnel and veterans. Presented at the American Association of Suicidology conference, Los Angeles, CA, April 11, 2014.
- Gutierrez, P. M. Toward a gold standard for suicide risk assessment for military personnel. Presented at the International Association for Suicide Prevention Congress, Oslo, Norway, September 27, 2013.
- Gutierrez, P. M., Joiner, T., Blatt, A., & Castro, C. United States military suicide prevention research: Navigating challenges and capitalizing on opportunities. Presented at the International Academy of Suicide Research World Congress on Suicide, Montreal, Quebec, Canada, June 12, 2013.
- Goodman, M., Gutierrez, P. M., Bossarte, R., Rasmussen, A. M., Brenner, L., & Stanley, B. Research updates and new directions for suicide prevention in the Veterans Administration. Discussant for symposium presented at the American Psychiatric Association annual meeting, San Francisco, CA, May, 19, 2013.
- Gutierrez, P. M. Alcohol and suicide: A deadly cocktail or misinterpretation of data? Plenary address presented at the American Association of Suicidology conference, Austin, TX, April 26, 2013.
- Gutierrez, P. M., Joiner, T., & Castro, C. Preventing suicide in the United States military: Research challenges and opportunities. Presented at the 14th European Symposium of Suicide & Suicidal Behavior, Tel Aviv-Jaffa, Israel, September 5, 2012.
- Gutierrez, P. M., Castro, C., Fitek, D. J., Holloway, M., & Jobes, D. A. Status of DoD funded suicide research. Presented at the Annual DoD/VA Suicide Prevention Conference, Washington, DC, June 20, 2012.
- Matarazzo, B., Gutierrez, P. M., & Silverman, M. M. The Self-Directed Violence Classification System: What it is and why it matters. Presented at the Annual DoD/VA Suicide Prevention Conference, Washington, DC, June 20, 2012.
- Gutierrez, P. M., Fitek, D. J., Joiner, T., Holloway, M., Jobes, D., & Rudd, M. D. Status of Department of Defense funded suicide research. Featured Panel presentation at the American Association of Suicidology conference, Baltimore, MD, April 20, 2012.
- Gutierrez, P. M. Navigating IRBs as a suicide researcher. Presented at the American Association of Suicidology conference, Baltimore, MD, April 19, 2012.
- Kemp, J., Thompson, C., Brown, G. K., Brenner, L. A., & Gutierrez, P. M. VA continuum of care for suicidal Veterans. Panel presentation at the American Association of Suicidology conference, Portland, OR, April 16, 2011.

- Gutierrez, P. M., & Lineberry, T. United States Army Medical Research and Materiel Command United States military suicide research: Activities and opportunities. Panel presentation at the American Association of Suicidology conference, Portland, OR, April 14, 2011.
- Bahraini, N., Gutierrez, P. M., Brenner, L. A., Hedegaard, H., & Huggins, J. The Colorado Violent Death Reporting System (COVDRS): Exploring factors associated with suicide in VA and non-VA services utilizing Veterans. Presented at the American Association of Suicidology conference, Portland, OR, April 14, 2011.
- Marshall, J., Gutierrez, P. M., Lineberry, T., & Jobes, D. United States Army Medical Research and Material Command United States military suicide research activities: Activities and opportunities. Panel presentation at the DOD/VA Annual Suicide Prevention Conference, Boston, MA, March 15, 2011.
- Gutierrez, P. M., Bahraini, N., Basham, C. M., Brenner, L. A., Hedegaard, H., Denneson, L. M., & Dobscha, S. K. Lessons learned about veteran suicide from the Colorado and Oregon Violent Death Reporting Systems. Presented at the American Association of Suicidology conference, Orlando, FL, April 22, 2010.
- Gutierrez, P. M. Blister packaging medication to increase treatment adherence and clinical response: Impact on suicide related morbidity and mortality. Presented at the 2010 DoD/VA Suicide Prevention Conference, Washington, DC, January 12, 2010.
- Gutierrez, P. M. Theater of War. Plenary Panel member at the 2010 DoD/VA Suicide Prevention Conference, Washington, DC, January 12, 2010.
- Bahraini, N., Gutierrez, P. M., Brenner, L. A., Hedegaard, H., Chase, M., & Shupe, A. The Colorado violent death reporting system: Exploring factors associated with suicide in VA and non-VA services utilizing veterans. Presented at the Centers for Disease Control and Prevention's NVDRS Reverse Site Visit, Denver, CO, May 14, 2009.
- Leach, R. L., Breshears, R. E., Brenner, L. A., Homaifar, B. Y., Gutierrez, P. M., Gorgens, K. M., & Harwood, J. E. F. The utility of the Personality Assessment Inventory for predicting violence in veterans with traumatic brain injury. Presented at the Rehabilitation Psychology Conference, Jacksonville, FL, February 27, 2009.
- Gutierrez, P. M. Collaborative assessment and management of suicide (CAMS): A feasibility study. DoD/VA Annual Suicide Prevention Conference, San Antonio, TX, January 13, 2009.
- Gutierrez, P. M., Brenner, L. A., Homaifar, B. Y., & Olson-Madden, J. H. VA VISN 19 MIRECC research and clinical efforts at suicide prevention. Symposium presented at the American Psychological Association convention, Boston, MA, August 15, 2008.
- Brausch, A. M., & Gutierrez, P. M. Body image and disordered eating in adolescent suicidality. Presented at the American Association of Suicidology conference, Boston, MA, April 17, 2008.
- Gutierrez, P. M. Redefining diversity: The chronically suicidal veteran as one example. Presidential address at the American Association of Suicidology conference, Boston, MA, April 17, 2008.
- Breshears, R. E., Brenner, L. A., & Gutierrez P. M. Predictive validity of the Personality Assessment Inventory in veterans with traumatic brain injury. Presented at the Rehabilitation Psychology Conference, Tucson, AZ, March 13, 2008.
- King, C. A., Gutierrez, P. M., & Jobes, D. A. Looking back – looking ahead: American suicidology at mid-life. Plenary panel presentation at the American Association of Suicidology conference, New Orleans, LA, April 12, 2007.
- Mazza, J. J., Reynolds, W. M., & Gutierrez, P. M. Screening for youth suicidal behavior revisited. Panel presentation at the American Association of Suicidology conference, New Orleans, LA, April 12, 2007.
- Schumacher, M., Quinnett, P., & Gutierrez, P. M. QPRT suicide risk assessment and management course utility. Panel presentation at the American Association of Suicidology conference, New Orleans, LA, April 12, 2007.
- Gutierrez, P. M. Change is good: What the past 40 years tell us about the future. Presidential address at the American Association of Suicidology conference, New Orleans, LA, April 12, 2007.

- Gutierrez, P. M. Suicide in the young adult population. Presented at the Department of Veterans Affairs Employee Education System's Evidence-Based Interventions for Suicidal Persons conference, Denver, CO, February 8, 2007.
- Rudd, M. D., Berman, L., Silverman, M. M., Gutierrez, P. M., & Schumacher, M. Warning signs for suicide: Theory, research, and clinical applications. Panel presented at the American Association of Suicidology conference, Seattle, WA, April 30, 2006.
- Freedenthal, S. L., & Gutierrez, P. M. Adolescents' disclosures of suicidality: Who knows? Presented at the American Association of Suicidology conference, Seattle, WA, April 30, 2006.
- Gutierrez, P. M. Shneidman Award Presentation – An integrated approach to assessing risk and protective factors for adolescent suicide. Presented at the American Association of Suicidology conference, Broomfield, CO, April 15, 2005.
- Schumacher, M., & Gutierrez, P. M. Bipolar spectrum traits and suicide risk. Presented at the American Association of Suicidology conference, Broomfield, CO, April 15, 2005.
- Gutierrez, P. M., & Osman, A. Prediction of adolescent suicide reattempts. Presented at the Kansas Conference in Clinical Child and Adolescent Psychology, Lawrence, KS, October 22, 2004.
- Gutierrez, P. M., & Konick, L. C. Evaluation of school-based suicide prevention programs. Presented at the Suicide Prevention: Advancing the Illinois Strategic Plan conference, Springfield, IL, September 23, 2004.
- Williams, J. E., Osman, A., Barrios, F., Kopper, B. A., & Gutierrez, P. M. Reliability and validity of the Inventory for Suicide Ideation – 30. Presented at the American Psychological Society conference, Chicago, IL, May 28, 2004.
- Hovey, J. D., Freedenthal, S., Gutierrez, P. M., & Fernquist, R. Career development strategies in suicide research #1: Working with a mentor. Panel presented at the American Association of Suicidology conference, Miami, FL, April 15, 2004.
- Conwell, Y., Silverman, M., Gutierrez, P. M., Konick, L. C., & Muehlenkamp, J. J. Career development strategies in suicide research #3: Publishing your findings. Workshop presented at the American Association of Suicidology conference, Miami, FL, April 16, 2004.
- Konick, L. C., & Gutierrez, P. M. Suicide risk in college students: A test of a model. Presented at the 2004 American Association of Suicidology conference, Miami, FL, April 16, 2004.
- Brausch, A. M., & Gutierrez, P. M. Does this magazine make me look fat? Media's impact on body image, depression, and eating. Presented at the Midwestern Psychological Association Conference, Chicago, IL, May 1, 2004.
- Muehlenkamp, J. J., Swanson, J., & Gutierrez, P. M. Differences between self-injury and suicide on measures of depression and suicidal ideation. Presented at the Midwestern Psychological Association annual meeting, Chicago, IL, May 9, 2003.
- Kaplan, M., Schultz, D., Gutierrez, P. M., Sanddal, N., & Fernquist, N. Suicide research: Working with a mentor. Panel presentation at the American Association of Suicidology annual conference, Santa Fe, NM, April 24, 2003.
- Konick, L. C., & Gutierrez, P. M. Is spirituality a moderator of risk for suicide? Presented at the American Association of Suicidology annual conference, Santa Fe, NM, April 25, 2003.
- Watkins, R. L., & Gutierrez, P. M. Exposure to peer suicide in college students. Presented at the American Association of Suicidology annual conference, Santa Fe, NM, April 25, 2003.
- Gutierrez, P. M., Osman, A., Watkins, R. L., Konick, L. C., Muehlenkamp, J. J., & Brausch, A. M. Development and validation of the Suicide Resilience Inventory - 25 (SRI-25) in clinical and nonclinical samples. Presented at the Kansas Conference in Clinical Child Psychology, Lawrence, KS, October, 19, 2002.
- Konick, L. C., Brausch, A. M., Gutierrez, P. M., & Pawlowski, C. CBT in depressed kids: What factors moderate treatment effectiveness? Presented at the Kansas Conference in Clinical Child Psychology, Lawrence, KS, October, 19, 2002.
- Hovey, J. D., Gutierrez, P. M., & Jha, A. Measuring cultural risk factors in suicide research. Panel presented at the American Association of Suicidology annual conference, Atlanta, GA, April 19, 2001.

- Gutierrez, P. M., Osman, A., Barrios, F. X., & Kopper, B. A. The Self-Harm Behavior Questionnaire. Presented at the American Association of Suicidology annual conference, Atlanta, GA, April 21, 2001.
- Gutierrez, P. M., Collura, D., & Watkins, R. A case for regular suicide risk screening in high schools. Presented at the Kansas Conference in Clinical Child Psychology, Lawrence, KS, October 14, 2000.
- Osman, A., Gutierrez, P. M., Kopper, B. A., Barrios, F. X., Breitenstein, J. L., & Silich, N. Validity and utility of the Adolescent Psychopathology Scale (APS) with adolescent psychiatric inpatients. Presented at the Kansas Conference in Clinical Child Psychology, Lawrence, KS, October 13, 2000.
- Kopper, B. A., Gutierrez, P. M., Osman, A., & Barrios, F. X. Helping kids stay alive: The Reasons for Living Inventory - Adolescents. Presented at Western Psychological Association Annual Convention, Portland, OR, April 14, 2000.
- Gutierrez, P. M., Rodriguez, P. J., & Foat, N. K. A model of late adolescent suicidality. Presented at the American Association of Suicidology annual conference, Houston, TX, April 15, 1999.
- Gutierrez, P. M., Osman, A., Kopper, B. A., & Barrios, F. X. Quality of risk assessment with common measures. Presented at the American Association of Suicidology annual conference, Bethesda, MD, April 18, 1998.

POSTER PRESENTATIONS (58):

- Acosta, M., Osman, A., Gutierrez, P. M., Bagge, C. L., Freedenthal, S., Wong, J. L., & Pirani, S. (2016, May). *The Multidimensional Revenge Attitudes Inventory: Validation of Scores on a New Measure of Revenge*. Presented at the meeting of the Association for Psychological Science, Chicago, IL.
- Hanson, J. E., Soberay, K., Dwyer, M., Gutierrez, P. M., & Plant, A. (2016, April). Understanding the Relationship of TBI, Severe Insomnia, and Suicidal Behaviors in Active Duty, Veteran, and Civilian Populations. Presented at the 49th Annual Conference of the American Association of Suicidology, Chicago, IL.
- Soberay, K., Dwyer, M., Hanson, J. E., Spinks, J., Soberay, A., & Gutierrez, P. M. (2016, April). The Dissemination of Military Research Understood through Altmetrics. Presented at the 49th Annual Conference of the American Association of Suicidology, Chicago, IL.
- Gutierrez, P. M., Brenner, L., Wortzel, H., Forster, J., & Leitner, R. Lessons learned about suicide prevention and patient safety from a medication packaging intervention. Presented at the IASR/AFSP International Summit on Suicide Research, New York, NY, October 13, 2015.
- Morris, B., O'Connor, S., Johnson, L. L., Jobes, D. A., Gutierrez, P. M., & Kaminer, B. B. Examining group differences between suicidal veterans classified as wish to live, ambivalent, or wish to die using the suicide index score. Presented at the American Association of Suicidology conference, Los Angeles, CA, April 11, 2014.
- Davidson, C. L., Babson, K. A., Hostetter, T. A., Crowley, K. J., Forster, J. F., Gutierrez, P. M.. *Exploring the relationship between physical activity and suicide risk among Veterans in the Behavioral Risk Factor Surveillance System Questionnaire*. Poster presented at the Suicide and Self-Injury Special Interest Group at the annual Association of Behavioral and Cognitive Therapies Conference, Nashville, TN, November 22, 2013.
- Soberay, K., Dwyer, M., Hanson, J., Ribeiro, J., Gronau, K., Gutierrez, P. M., & Maner, J. Exploring the MSRC common data elements: The relationship between TBI, severe insomnia, and suicidal behaviors in military populations. Presented at the American Psychological Association conference, Honolulu, HI, August 1, 2013.
- Pease, J., Soberay, K., Dwyer, M., Gronau, K., & Gutierrez, P. M. Thwarted belonging makes a modest contribution to suicidal ideation after controlling for universalism and relationships. Presented at the American Psychological Association conference, Honolulu, HI, August 1, 2013.
- Leitner, R., Gutierrez, P. M., Brenner, L., Wortzel, H., Forster, J. E., & Huggins, J. Psychometric properties of the Self-harm Behavior Questionnaire in Veterans. Presented at the American Psychological Association conference, Honolulu, HI, July 31, 2013.

- Dwyer, M. M., Soberay, K., Hanson, J., & Gutierrez, P. M. Military suicide research consortium (MSRC). Presented at the American Association of Suicidology conference, Austin, TX, April 26, 2013.
- Rings, J. A., Gutierrez, P. M., Harwood, J. E. F., & Leitner, R. Examining prolonged grief symptomatology and its relationship to self-directed violence among Veterans. Presented at the Veterans Affairs Mental Health Conference. Baltimore, MD, August 23, 2011.
- Rings, J. A., Gutierrez, P. M., & Harwood, J. E. F. Prolonged grief disorder and its relationship to self-directed violence among Veterans: Preliminary findings. Presented at the Departments of Defense and Veterans Affairs Suicide Prevention Conference. Boston, MA, March 15, 2011.
- Huggins, J., Homaifar, B.Y., Skopp, N.A., Reger, M., Gahm, G., Gutierrez, P., & Brenner, L.A. Suicide prevention through the transformation of data into information. Presented at the Departments of Defense and Veterans Affairs Suicide Prevention Conference. Boston, MA, March 15, 2011.
- Betthausen, L. M., Allen, E., Brenner, L. A., & Gutierrez, P. M. Centrality of intimate relationships on failed belongingness and perceived burdensomeness in returning combat Veterans. Presented at the International Association for Relationship Research, Lawrence, KS, November, 2009.
- Bahraini, N., Gutierrez, P. M., Brenner, L. A., Huggins, J., Hedegaard, H., Shupe, A., & Chase, M. The Colorado violent death reporting system: Exploring factors associated with suicide in VA and non-VA services utilizing veterans. Presented at the American Psychological Association conference, Toronto, Ontario Canada, August 6, 2009.
- Brausch, A. M., & Gutierrez, P. M. Psychosocial factors related to non-suicidal self-injury in adolescents. Presented at the American Association of Suicidology annual conference, San Francisco, CA, April 17, 2009.
- Ballard, E. D., Jobes, D., Brenner, L., Gutierrez, P. M., Nagamoto, H., Kemp, J., et al. Qualitative suicide status form responses of suicidal veterans. Presented at the American Association of Suicidology conference, Boston, MA, April 18, 2008.
- Bahraini, N., Gutierrez, P. M., Brenner, L. A., Staves, P., Cornette, M., & Betthausen, L. Pain tolerance and links to increased suicide risk. Presented at the American Association of Suicidology conference, Boston, MA, April 18, 2008.
- Cornette, M. M., DeBoard, R. L., Clark, D. C., Holloway, R. H., Brenner, L., Gutierrez, P. M., & Joiner, T. E. Examination of an interpersonal-behavioural model of suicide: Toward greater specificity in suicide risk prediction. Presented at the International Association for Suicide Prevention conference, Dublin, Ireland, August 31, 2007.
- Brenner, L. A., Gutierrez, P. M., Cornette, M., Staves, P. J., & Betthausen, L. M. Veterans' experiences of habituation to painful stimuli, perceived burdensomeness and failed belongingness. Presented at the American Psychological Association conference, San Francisco, CA, August 19, 2007.
- Fang, Q., Choma, K., Salvatore, A., Mack, T., Bailey, J., & Gutierrez, P. M. Validation of the Pain Distress Inventory using an adolescent inpatient sample. Presented at the Kansas Conference in Clinical Child and Adolescent Psychology, Lawrence, KS, October 19, 2006.
- Brausch, A. M., & Gutierrez, P. M. Adolescent gender differences in reasons for living. Poster presented at the American Association of Suicidology conference, Seattle, WA, April 30, 2006.
- Swanson, J. D., & Gutierrez, P. M. Gender, social support, and student suicidality. Poster presented at the American Association of Suicidology conference, Seattle, WA, April 30, 2006.
- Kopper, B. A., Osman, A., Gutierrez, P. M., Williams, J. E., & Barrios, F. X. Suicide Resilience Inventory-25: Validation with normal and adolescent psychiatric inpatients. Poster presented at the 2005 APA conference, Washington, DC.
- Kopper, B. A., Osman, A., Barrios, F. X., Gutierrez, P. M., & Williams, J. E. The Beck Depression Inventory-II with nonclinical and inpatient adolescents. Poster presented at the 2005 APA conference, Washington, DC.
- Brausch, A. M., & Gutierrez, P. M. Ethnic differences in body image, affect, and eating behaviors and the impact of media exposure. Presented at the Association for the Advancement of Behavior Therapy conference, New Orleans, LA, November 11, 2004.

- Muehlenkamp, J. J., & Gutierrez, P. M. Validation of the Self-Harm Behavior Questionnaire in adolescents. Presented at the Association for the Advancement of Behavior Therapy conference, New Orleans, LA, November 11, 2004.
- Linden, S., Osman, A., Barrios, F. X., Kopper, B. A., Williams, J. E., & Gutierrez, P. M. Structure of the Adolescent Psychopathology Scale (APS) clinical subscales in psychiatric inpatients. Presented at the Association for the Advancement of Behavior Therapy conference, New Orleans, LA, November 11, 2004.
- Osman, A., Williams, J. E., Barrios, F. X., Kopper, B. A., Gutierrez, P. M., Linden, S. C., & Carlson, N. Development of cutoff scores for the Beck scales in adolescent psychiatric inpatients. Presented at the Kansas Conference in Clinical Child and Adolescent Psychology, Lawrence, KS, October 21, 2004.
- Osman, A., Barrios, F. X., Gutierrez, P. M., Kopper, B. A., Williams, J. E., Carlson, N., & Koser, K. Reliability and validity of the Multidimensional Anxiety Scale for Children and the Children's Depression Inventory. Presented at the Kansas Conference in Clinical Child and Adolescent Psychology, Lawrence, KS, October 21, 2004.
- Osman, A., Gutierrez, P. M., Barrios, F. X., Kopper, B. A., Linden, S. C., Carlson, N., & Koser, K. The Reynolds Adolescent Depression Scale 2: Reliability and validity. Presented at the Kansas Conference in Clinical Child and Adolescent Psychology, Lawrence, KS, October 21, 2004.
- Muehlenkamp, J. J., & Gutierrez, P. M. Are self-injurious behaviors and suicide attempts different points on the same continuum? Presented at the Suicide Prevention: Advancing the Illinois Strategic Plan conference, Springfield, IL, September 23, 2004.
- Brausch, A. M., Swanson, J., & Gutierrez, P. M. Parent marital status, depression and suicide. Presented at the American Association of Suicidology conference, Miami, FL, April 16, 2004.
- Konick, L. C., Gutierrez, P. M., Muehlenkamp, J. J., Watkins, R. L., Ward, K. E., & Haase, K. Development of the Spiritual Attitudes and Beliefs Inventory: Phase II. Presented at the Midwestern Psychological Association annual meeting, Chicago, IL, May 8, 2003.
- Konick, L. C., Gutierrez, P. M., & Watkins, R. L. Adult Suicidal Ideation Questionnaire psychometrics. Presented at the American Association of Suicidology annual conference, Santa Fe, NM, April 25, 2003.
- Gutierrez, P. M., & Muehlenkamp, J. J. Understanding differences between self-injurious behavior and suicide attempts in high school students. Presented at the Kansas Conference in Clinical Child Psychology, Lawrence, KS, October, 18, 2002.
- Gutierrez, P. M., Osman, A., Brausch, A. M., Muehlenkamp, J. J., Watkins, R. L., & Konick, L. C. Reliability and validity of the Beck scales in the assessment of suicide-related behaviors in adolescent psychiatric inpatients. Presented at the Kansas Conference in Clinical Child Psychology, Lawrence, KS, October, 18, 2002.
- Gutierrez, P. M., Osman, A., Watkins, R. L., & Muehlenkamp, J. J. Potential racial differences in adolescent suicide risk. Presented at the Kansas Conference in Clinical Child Psychology, Lawrence, KS, October, 18, 2002.
- Osman, A., Gutierrez, P. M., Kopper, B. A., Barrios, F. X., Boyle, T., & Duncan, A. The Inventory of Suicide Orientation - 30: Further validation with adolescent inpatients. Presented at the Kansas Conference in Clinical Child Psychology, Lawrence, KS, October, 18, 2002.
- Osman, A., Linden, S., Gutierrez, P. M., Barrios, F. X., Kopper, B. A., & Forman, K. Validity of the Adolescent Psychopathology Content Scales (APS) in Pediatric Medical Institute for Children (PMIC) inpatients. Presented at the Kansas Conference in Clinical Child Psychology, Lawrence, KS, October, 18, 2002.
- Konick, L. C., Wrangham, J. J., Gutierrez, P. M., Blacker, D., Watkins, R. L., Aalders, G., Giannerini, J., Miller, M. J., Rapp, J. M., Shayne, L. E., & Ward, K. E. Development of the Spiritual Attitudes and Beliefs Inventory (SABI). Presented at the annual meeting of the Midwestern Psychological Association, Chicago, IL, May 2, 2002.

- Gutierrez, P. M., Wrangham, J., Konick, L., Osman, A., & Barrios, F. X. Does ethnicity influence adolescent suicide risk? Presented at the American Association of Suicidology annual conference, Bethesda, MD, April 12, 2002.
- Wrangham, J., Gutierrez, P. M., Osman, A., & Barrios, F. X. Validation of the PANSI with minority young adults. Presented at the American Association of Suicidology annual conference, Bethesda, MD, April 12, 2002.
- Konick, L. C., Brandt, L. A., & Gutierrez, P. M. School-based suicide prevention programs: A meta-analysis. Presented at the American Association of Suicidology annual conference, Bethesda, MD, April 12, 2002.
- Gutierrez, P. M., Osman, A., Kopper, B. A., & Barrios, F. X. Use of the Multi-Attitude Suicide Tendency Scale with minority individuals. Presented at the meeting of the Midwestern Psychological Association, Chicago, IL, May 4, 2001.
- Valentiner, D., Gutierrez, P. M., Deacon, B., & Blacker, D. Factor structure and incremental validity of the Anxiety Sensitivity Index for Children in an adolescent sample. Presented at the annual meeting of the Society for Research in Child Development, Minneapolis, MN, April 21, 2001.
- Gutierrez, P. M., Rodriguez, P. J., & Garcia, P. Minority suicide risk. Presented at the American Association of Suicidology annual conference, Los Angeles, CA, April 13, 2000.
- Kopper, B. A., Gutierrez, P. M., Osman, A., Barrios, F. X., Baker, M. T., & Haraburda, C. M. Reasons for Living Inventory for Young Adults: Psychometric properties. Presented for Division 17 - Counseling Psychology - at the annual convention of the American Psychological Association, Washington, DC, August 5, 2000.
- Kopper, B. A., Gutierrez, P. M., Osman, A., Barrios, F. X., & Bagge, C. L. Assessment of suicidal ideation in college students. Presented for Division 17 - Counseling Psychology - at the annual convention of the American Psychological Association, Washington, DC, August 5, 2000.
- Gutierrez, P. M., Rubin, E. C., & Blacker, D. A preliminary investigation of the role of suicide exposure and attitudes about death on adolescent suicidal ideation. Presented at the Midwestern Psychological Association annual conference, Chicago, IL, May 4, 2000.
- Martin, H., & Gutierrez, P. M. The role of mediating factors on the long-term relationship between early parental death and later depression and anxiety. Presented at the Midwestern Psychological Association Annual Conference, Chicago, IL, May 4, 2000.
- Kopper, B. A., Osman, A., Gilpin, A. R., Panak, W. F., Barrios, F. X., Gutierrez, P. M., & Chiros, C. E. The Multi-Attitude Suicide Tendency Scale: Further validation with adolescent psychiatric inpatients. Presented at the annual convention of the American Psychological Association, Boston, MA August 22, 1999.
- Kopper, B. A., Osman, A., Linehan, M. M., Barrios, F. X., Gutierrez, P. M., & Bagge, C. L. Validation of the Adult Suicide Ideation Questionnaire and the Reasons for Living Inventory in an adult psychiatric inpatient sample. Presented at the annual convention of the American Psychological Association, Boston, MA August 22, 1999.
- Osman, A., Bagge, C. L., Barrios, F. X., Gutierrez, P. M., & Kopper, B. A. Receiver operating characteristic curve analyses of the Beck Depression Inventory - II in adolescent psychiatric inpatients. Presented at the Kansas Conference in Clinical Child Psychology, Lawrence, KS, October 9, 1998.
- Osman, A., Bagge, C. L., Gutierrez, P. M., Kopper, B. A., & Barrios, F. X. Validation of the Reasons for Living Inventory for Adolescents (RFL-A) in a clinical sample. Presented at the Kansas Conference in Clinical Child Psychology, Lawrence, KS, October 9, 1998.
- Kopper, B. A., Osman, A., Hoffman, J., Gutierrez, P. M., & Barrios, F. X. Reliability and validity of the BDI-II with inpatient psychiatric adolescents. Presented at Division 12 - Clinical Psychology - at the annual convention of the American Psychological Association, San Francisco, CA, August 16, 1998.
- Gutierrez, P. M., & Hagstrom, A. H. Uses for the Multi-Attitude Suicide Tendency Scale. Presented at the American Association of Suicidology annual conference, Bethesda, MD, April 17, 1998.
- Gutierrez, P., & Williams, J. Children's understanding of death. Presented at the Midwestern Psychological Association annual meeting, Chicago, IL, May, 3, 1991.

GRANTS:

- 3/16-3/21 Department of Defense, Military Operational Medicine Research Program, grant; Principal Investigator: jointly with Thomas Joiner, Ph.D., Florida State University; **\$14,189,843.00** [additional **\$5,810,157.00** for option period years 3-5] for *Military Suicide Research Consortium: Extension to New Opportunities and Challenges*.
- 10/12-9/15 Department of Veterans Affairs National Center for Patient Safety; Advisory Board member (PI Monica Matthieu, Ph.D., LCSW); **\$569,222** for *Patient Safety Center of Inquiry for Suicide Prevention*.
- 7/12-9/16 Military Suicide Research Consortium; Principal Investigator; **\$2,381,228** for *Toward a Gold Standard for Suicide Risk Assessment for Military Personnel*. [currently in no-cost extension year]
- 3/11-2/13 Department of Defense, Military Operational Medicine Research Program, grant; Consultant (PI Steven Vannoy, Ph.D., MPH); **\$1,354,386** for *Development and Validation of a Theory Based Screening Process for Suicide Risk*.
- 3/11-3/17 Department of Defense, Military Operational Medicine Research Program, grant; Co-Investigator; **\$3,400,000** for *A Randomized Clinical Trial of the Collaborative Assessment and Management of Suicidality vs. Enhanced Care as Usual for Suicidal Soldiers*. [currently in second no-cost extension year]
- 9/10-9/16 Department of Defense, Military Operational Medicine Research Program, grant; Principal Investigator: jointly with Thomas Joiner, Ph.D., Florida State University; **\$15,000,000 (additional \$15,000,000 going to FSU)** for *Military Suicide Research Consortium*. [currently in no-cost extension year]
- 9/09-9/14 Department of Defense, Military Operational Medicine Research Program, grant; Principal Investigator; **\$1,173,408** for *Blister Packaging Medication to Increase Treatment Adherence and Clinical Response: Impact on Suicide-related Morbidity and Mortality*.
- 5/09-5/10 Colorado TBI Trust Fund Education grant; **\$8427** to support the hosting of a conference of national experts in suicide safety planning and TBI rehabilitation.
- 5/08-5/09 Colorado TBI Trust Fund Education grant; **\$5,000** to support the hosting of a conference of national experts in assessment of TBI and suicide risk and the role of executive dysfunction in linking the two problems.

HONORS AND AWARDS:

- 2014 Roger J. Tierney Award for Service, American Association of Suicidology.
- 2005 Shneidman Award for Significant Contributions to Suicide Research, American Association of Suicidology
- 2003 Outstanding Young Alumni, Winona State University

PROFESSIONAL SERVICE:

- 10/15- University of Colorado School of Medicine Faculty Promotions Committee
- 6/14-8/14 Expert Adviser for the Royal Australian & New Zealand College of Psychiatrists Clinical Practice Guidelines Project on Deliberate Self-harm, Prof. Gregory Carter, Chair
- 1/12-10/15 Department of Psychiatry Faculty Promotions Committee
- 1/12- Editorial Board Member, *Archives of Suicide Research*, Barbara Stanley, Ph.D., Editor-in-Chief
- 4/09- Associate Editor, *Suicide and Life-Threatening Behavior*, Thomas Joiner, Ph.D., Editor-in-Chief.
- 4/09-4/11 Past-president, Board position, of the American Association of Suicidology.

3/09-12/09	U. S. Army Suicide Reduction and Prevention Research Strategic Planning Workgroup, Soldier Identification and Case Management Expert Lead.
5/07-10/08	Member of the International Advisory Board for the Australian National Study of Self Injury (ANESSI), Professor Graham Martin, Director.
4/07-4/09	President of the American Association of Suicidology.
3/06-3/07	Reviewer for National Registry of Evidence-based Programs and Practices, Substance Abuse and Mental Health Services Administration.
4/05-4/07	President-Elect of the American Association of Suicidology.
2/04-4/09	Consulting Editor and Editorial Board member, <i>Suicide and Life- Threatening Behavior</i> , Morton M. Silverman, M.D., Editor-in-Chief.
11/02-6/06	Member, Illinois Suicide Prevention Strategic Planning Task Force, Illinois Department of Public Health.
3/02-1/06	Member, American Association of Suicidology Institutional Review Board.
4/00-4/03	Director, Research Division, American Association of Suicidology.
4/99-	Ad hoc reviewer for <i>Psychiatry Research; Journal of Personality Assessment; American Journal of Public Health; Internal Journal of Circumpolar Health; Death Studies; Social Problems; Journal of Adolescent Research; Child Abuse and Neglect; British Journal of Clinical Psychology; Journal of Clinical and Consulting Psychology; Journal of Abnormal Psychology; International Journal of Psychology; Archives of Suicide Research; American Journal of Orthopsychiatry; Journal of Mental Health Counseling; Crisis</i> .
1998-2002	Member, North Central Association Outcomes Endorsement Team for Auburn High School, Rockford, IL.
7/98-4/00	Chair, Publications Committee, American Association of Suicidology.
1998-2006	Director, Adolescent Risk Project, Auburn High School, Rockford, IL. Combined research and suicide risk screening project.
1997-2006	Faculty Associate of the Center for Latino and Latin-American Studies at Northern Illinois University.

MEMBERSHIP IN PROFESSIONAL ORGANIZATIONS:

12/15-	Society for Implementation Research Collaboration, Founding Member
2010-	International Academy for Suicide Research, Fellow
2007-	Colorado Psychological Association
2003-2010	International Academy for Suicide Research, Associate Member
1999-	APA Div. 12, Section VII, Clinical Emergencies and Crises
1998-2010	APA Div. 53, Society of Clinical Child and Adolescent Psychology
1997-2007	Midwestern Psychological Association
1996-	American Association of Suicidology

A2 Effectiveness of a Virtual Hope Box Smartphone App in Enhancing Veteran's Coping with Suicidal Ideation: A Randomized Clinical Trial
Nigel Bush, Ph.D.

Task 1: Finalize agreements and subcontracts with participating clinical site (Months 1) -Complete

1a: Finalize agreement with VAMC-Portland clinical test site and its leadership for this project;

1b: Finalize subcontracts with this site.

Task 2: Hire and train T2 and Portland study staff (Months 1-3) - Complete

2a: Hire T2 software engineer;

2b: Hire site research coordinator.

2c: Site project manager and site clinical coordinator.

2d: train new site research coordinator in human subjects and other research protections, study policies and procedures, app specifications, and patient participant recruitment and testing procedures;

Task 3: Refine Pilot VHB-β into Production VHB 1.0 and test. (Months 1-12) – Complete

3a: Software engineer translates updated specs derived from pilot testing of VHB-β into production VHB 1.0 app;

3b: Study staff recruits participants from active service member population to test the production VHB 1.0 app for usability;

3c: If necessary, software engineer modifies VHB 1.0 app further based on usability testing feedback from participants;

3d: Software engineer provides initial technical support to clinical site for first year.

Task 4: Set up Portland clinical site (Months 1-4) - Complete

4a: Co-PI, T2 Research Coordinator (RC), site-PI, local behavioral health staff/clinicians, and relevant site operations staff meet at VA-based clinical test site introduce the study, and finalize procedures;

4b: VA site obtains approval from site IRB.

Task 5: Implementation of clinical site intervention and data collection (Months 5-18) – Complete

5a: Site research and clinical coordinators work with behavioral health staff/clinicians to recruit patient participants;

- Recruitment at the Portland VA is complete with 118 subjects enrolled resulting in a final sample of 106.

5b: participants randomized to two arms comparing VHB with enhanced treatment as usual (ETAU);

5c: intervention participants work iteratively over course of therapy with clinicians to develop personal VHB;

5d: participants use VHB or enhanced TAU offsite;

5e: outcome measures collected.

KEY RESEARCH ACCOMPLISHMENTS

- Main findings from this project were presented at: The American Association of Suicidology Annual Meeting. Chicago IL, March 31, 2016.
- Main findings are under consideration for publication in: Psychiatric Services
- The Virtual Hope Box study team received the 2014 Department of Defense Innovation Award from Assistant Secretary of Defense Woodson
- Since release to the Android and IOS market places as a free app in March 2014, the Virtual Hope Box has been downloaded more than 150,000 times and has received an unprecedented flood of positive endorsements from downloaders (308 positive vs 21 negative comments in 2015), and testimonials of benefit from providers and patients. The VHB has been downloaded by users in

more than a dozen countries across Asia, the Pacific, Europe, Canada, Africa, the Middle East, India, Latin America and the Caribbean, as well as within the USA

- The VHB is now used as a key component of the national provider training program “Using Technology in Behavioral Health Care” conducted with military and VA providers by the National Center for Telehealth and Technology
- The VHB was selected in 2016 for the first pilot test of The Defense Centers of Excellence for Psychological Health and TBI new knowledge translation (KT) program
- Numerous media features including interview with Irish Times
- VHB Promotional video made by Army Medicine Performance Triad:
<https://www.youtube.com/watch?v=vCe12gUa878&list=PL3evLnVMtkRScloQ1mKyFMKpvnLxJl7yt&index=1Video>

REPORTABLE OUTCOMES

Publications:

1. Bush, N. E., Dobscha, S. K., Crumpton, R., Denneson, L. M., Hoffman, J. E., Crain, A., & Kinn, J. T. (2015). A Virtual Hope Box Smartphone App as an Accessory to Therapy: Proof-of-Concept in a Clinical Sample of Veterans. *Suicide and Life-Threatening Behavior*, 45(1), 1-9.

Presentations describing various findings from this study:

2. **Bush NE**, Armstrong C, Blasko K, Cooper D, Pruitt L. Panel and presentations. Mobile and Personal Technologies for Military Mental Health. International Society for Research on Internet interventions (ISRII) annual conference, April 7-9, 2016, Seattle, WA.
3. **Bush NE**, Dobscha SK. Effectiveness of the Virtual Hope Box smartphone application for emotion regulation and stress reduction: results from a randomized controlled clinical trial of veterans with suicidal ideation. American Association of Suicidology Annual Meeting. Chicago IL, March 31, 2016.
4. **Bush NE**, Armstrong C, Stewart A. Using Technology in Behavioral Health Care, December 3, 2015, Naval Medical Center, San Diego, CA
5. Dobscha SK, & **Bush NE**. Preliminary Results from a Randomized Clinical Trial of a Smartphone Application for Veterans with Suicidal Ideation. VA National Suicide Prevention Cyberseminar, 10-13-2015.
6. **Bush NE**, Dobscha SK. Effectiveness of the Virtual Hope Box smartphone application for emotion regulation and stress reduction: Preliminary results from a randomized controlled clinical trial of veterans with suicidal ideation. 2015 Military Health Systems Research Symposium, August 17-21, 2015, Fort Lauderdale, FL.
7. Denneson LM, Dobscha SK, **Bush NE**. Design and early findings from a randomized controlled trial of a smartphone application for veterans with suicidal ideation. Panel Discussion: On the front lines of military suicidology. American Association of Suicidology Annual Meeting. Atlanta GA, April 16, 2015.
8. **Bush NE**, Dobscha SK. A Virtual Hope Box Smartphone App: Proof of Concept in a Clinical Sample of Veterans. “2015 VA/DoD Suicide Prevention Conference- One Connection, One Conversation, One Small Act-It Matters” January 27-30, 2015, Dallas TX.
9. **Bush NE**, Dobscha SK. A Virtual Hope Box Smartphone App: Proof of Concept in a Clinical Sample of Veterans. “Federal Health in Transition,” AMSUS: The Society of Federal Health Professionals Annual Meeting, December 2-5, 2014, Washington DC.
10. **Bush N.** & Dobscha S. Effectiveness of a Virtual Hope Box Smartphone App in Enhancing Veterans’ Coping with Suicidal Ideation: A Randomized Controlled Trial. *Military Health System Research*

Symposium (MHSRS) 2014. Ft. Lauderdale FL. August 21, 2014.

Webinar/Online Presentations

11. **Bush N.** & Wheeler W. The Virtual Hope Box. American Association of Suicidology, Suicide Prevention Social Media- Weekly Twitter Chats with Expert Guests. September 21, 2014.
12. **Bush N.** & Stewart A. Integration of Mobile Health Technologies in Clinical Practice. Dept. of Defense Public Health Quad Service Collaboration. Webinar. September 11, 2014.

Media

- 03/20/2016 The Virtual Hope Box: An App Every Marine Needs: Marine Corps Community Services. <http://www.usmc-mccs.org/articles/the-virtual-hope-box-an-app-every-marine-needs/>
- 03/03/2016 VHB Promotional video made by Army Medicine Performance Triad: https://www.youtube.com/watch?v=vCe12gUa878&list=PL3evLnVMtkRSclOQ1m_KyFMKpnlxJl7yt&index=1Video
- 10/2/2015: Health.Mil Q&A with Dr. Nigel Bush on Virtual Hope Box, his team's 2014 MHS Innovation Award-winning mobile app: <http://health.mil/News/Articles/2015/10/02/Bright-spots-of-innovation-QA-with-past-Innovation-Award-winner-Nigel-Bush>
- 9/24/2015: Interview with Dr. Nigel Bush on Virtual Hope Box by Irish Times.
- 9/24/2015: What's in Your Hope Box?- David Susman PhD. <http://davidusman.com/2015/09/24/whats-in-your-hope-box/>
- 9/14/2015: Tools are available to prevent, educate- Defense Video and Imagery Distribution System. <https://www.dvidshub.net/news/175178/tools-available-prevent-educate#>
- 9/11/2015: Virtual Hope Box puts suicide prevention tools at users' fingertips. Health.mil review of presentation on Virtual Hope Box by Dr. Nigel Bush: <http://www.health.mil/News/Articles/2015/09/11/Virtual-Hope-Box-puts-suicide-prevention-tools-at-users-fingertips>

CONCLUSION

The VHB is a demonstrably useful and highly regarded accessory to primary treatment – an easily accessible tool that users report helps restore stability/homeostasis “when and as needed” and that additionally appears to increase stress coping skills. While impacts on other outcomes were limited, users noted multiple benefits. In light of the fact that VHB has been and can further be easily disseminated across a large population of users, VHB may have broad, positive utility in behavioral health care.

A3 A Behavioral Sleep Intervention for Suicidal Behaviors in Military Veterans: A Randomized Controlled Study
Rebecca Bernert, Ph.D.

Task 1: Secure Approvals, Hire/Train Personnel, Prepare for Data Collection

Complete

IRB/ R&D/ HRPO/ Sponsor Approvals: Complete

- IRB submission and approval for several modifications (Approved July 2015)

Data and Safety Monitoring Board Assembly and Clinical Trials Registry: Complete

- Finalized assembly and membership of DSMB
- Registered protocol at Clinicaltrials.gov
- Registered protocol at Stanford Clinical Trials Registry

Task 2: Hire/Train Personnel, Prepare for Data Collection, Initiate Recruitment and Screening/Randomize 76 Eligible Veterans

Complete

Personnel/ Stanford/ PAIRE Hiring and WOC VAPAHCS Appointment Processing/ Badging: Complete

- Completed hiring search and institutionally-required job postings/ employment paperwork for project staff
- Founded research program (Suicide Prevention Research Laboratory) and initiated formal affiliation with Stanford Mood Disorders Centers
- Developed trainee apprenticeship program in affiliation with Stanford University, Palo Alto University (clinical psychology graduate programs PhD/PsyD), and VA Palo Alto HCS Volunteer Services to further expand lab and research assistant infrastructure to support project management; retained two PhD students as part of this 2-year program; initiated associated Stanford-related and WOC paperwork

Study Investigator Meetings/ Consultation Meetings: Complete

- Completed regularly-scheduled Consultation and Co-Investigator meetings

Equipment/ Infrastructure/ Protocol Development and SOP Manual Development: Complete

- Purchased and installed Presentation software at Lucas Center to enable ongoing data collection in fMRI scanning sub-arm.
- Completed training of Study Coordinator in execution of fMRI computer tasks to increase coverage and facilitate execution of fMRI scanning study.
- Completed training for salivary sampling sub-arm for J. Kim (Study Coordinator) and T. Dondero (Summer Medical Student Fellow) and continued development of salivary sampling protocol; Successfully completed launch of salivary sampling sub-arm.
- Worked with Stanford Financial Support Center staff to ensure that all participant compensation materials and procedures are in compliance with new, heightened Stanford patient confidentiality standards.
- Worked with Stanford IT staff to ensure that all laboratory computers are in compliance with new, heightened Stanford security standards (encryption, back-up, and phase-out of non-compliant computers).
- Worked with Stanford IT staff to repair study computer and service laboratory telephone lines.
- Worked with Stanford administrative staff to obtain study space for participant computer use, ratings, and treatment sessions, amid Departmental and SOM space restructuring.
- Continued revisions/standardization to lab manual, SOP manual, study materials, and training manuals.
- Continued development of fMRI scanning protocol.

Recruitment and Screening: Complete

- Recruitment efforts include a comprehensive recruitment plan developed in partnership with military installations and outreach services within VA programs, clinic presentations, chart reviews and direct mailings, and participation in military-specific events.

- Initiated recontacts for notifying inclusion criteria change through phone and email, and conducted rescreen assessments over phone
- Conducted subject recruitment and screening
- Conducted Baseline, Treatment Weeks 1-4, and Follow-up visits eligible warriors.
- Invitation of participants for additional treatment following study unblinding at follow-up.
- Conducted quality control checks of clinical data. Monitored safety, adverse events for DSMB reporting.
- Recruitment activities generated N=731 new contacts expressing interest in the study.
- Of these, N=382 individuals were screened, of whom N=141 met initial inclusion criteria (N=7 met criteria for delayed eligibility visit due to delay criteria) for eligibility assessment; N=82 completed eligibility visits.
- Of N=82 eligibility assessment visits completed, N=63 were deemed eligible and enrolled in the study, and subsequently successfully randomized to treatment.
- To date, N=56 participants have completed treatment and are now in follow-up study phases; N=3 participants withdrew prior to receiving treatment due to personal scheduling constraints.
- Continued to conduct quality control checks of clinical data; monitor safety and adverse events for DSMB reporting.

Initiated Database Development & Data Entry: Complete

- Maintained study databases to support data entry and quality control data verification checks.
- (Continued) Conducted quality control checks of clinical data; trained lab trainees to monitor, input, and cross-check data using standardized procedures under supervision of lab manager and study PI.
- Completed training of additional lab personnel to facilitate double-scoring, double-entry protocol; instituted new quality controls to alert PI to any deviations to database entry/verification/management.

Task 3: Complete Follow-Up Testing, Conduct Data Analyses, Prepare for Publications

Ongoing

Results and Significance

- Successful coordination and execution of N=63 participants enrolled (of which, N=56 have completed treatment; 8 groups and 29 individuals) serves as a feasibility proof of concept.
- Formal data analyses have not been conducted for primary analyses; database development and data entry are actively underway, with verification of data ongoing. Preliminary subanalyses have been conducted.

Work Subsumed under K23MH093490:

As advised by MSRC Directors (9/23/16), a summary of work is provided and detailed below. As requested, the following information is also provided: (1) Date when anticipated work will be concluded, and (2) Statement noting date of Final Report submission, with all accompanying materials (quad chart, consort table), per contract and as advised by MSRC.

History: To facilitate concurrent funding of this award and K23MH093490, given budgetary restrictions associated with salary funding limitations (ie, preventing cost-sharing and concurrent salary support from federally-funded NIH/DOD projects), this award was subsumed under K23MH093490 (March 2012), following consultation with NIH program staff and approval by MSRC Directors (1/27/12). This granted concurrent funding, with 100% of PI salary effort assigned to the K23. Approval was based on the shared goals of both projects, which enabled the larger, MSRC grant to be subsumed under the career development training goals of the K23. In addition to MSRC approval, this modification was approved by NIH and represented in all subsequent progress reports. Stanford RMG and IRB approval was obtained to

likewise list NIH as an additional sponsor to ensure appropriate record-keeping regarding funds charged to the K23/associated with the current project and as advised for audit purposes.

Summary of Related Work: Work for the current project will reflect the final weeks of enrollment, treatment, and follow-up to facilitate the proposed target sample. Current enrollment of participants is N=63. Prior to the slated close of the study, N=76 participants are targeted to complete this project as proposed.

End Date: This work will be concluded at the original close of K23MH093490 award, 12/31/16. Remaining costs to support study conduct will not be drawn from MSRC funding (NCE closed 9/27/16), but instead sourced to the K23 as subsumed. Personnel and non-human subject payment costs may be sourced to this award or to a discretionary fund to complete the study as planned. Finally, because both trials were maintained to facilitate study conduct and enrollment during two PI absences (medical leaves: January-May 2014, August 2015-November 2016), an NCE request is planned for K23MH093490 to fulfill NIH study/career development activities. For the current project, work will nonetheless be concluded by 12/31/16, independent of NCE request.

Final Report Submission: The Final Report for this award will be submitted no later than 1/27/17, as advised by MSRC Directors.

A4 Neuroimaging Correlates of Suicide

Deborah Yurgelun-Todd, Ph.D. & Perry Renshaw, MD, Ph.D., MBA

Phase 1: Submission/Planning Phase (months 0-1) - **Complete**

Task 1: Submission of an amendment to our previously approved neuroimaging study entitled Neurobiology of Suicide Risk in Traumatic Brain Injury and Substance Abuse.

Phase II: Recruitment, Clinical Assessments, Neuroimaging and Data Collection (months 1-21). – **Complete**

Task 1: Subject Recruitment (months 1-21).

We will recruit 80 Veterans with and without a history of SDV.

- Eighty-one veterans (65 males, 16 females) completed the demographic, clinical, and cognitive assessment measures. One participant was not able to complete the neuroimaging therefore 80 veterans completed the full study protocol. All veterans were between the ages of 20 and 54 with an average age of 37.15 years. Males reported an average of 14.75 years of education, whereas females reported an average 15.62 years. We have begun preliminary analysis of the data.

Descriptive statistics for the sample are described below and in Table 1.

Age (mean years; range)	37.15; 20-54
Sex	65 male, 16 female
Air Force	9
Air Force Reserves	5
Air Force National Guard	2
Army	25
Army Reserves	16
Army National Guard	11
Coast Guard	1
Coast Guard Reserves	0
Marines	11
Marine Reserves	3
Navy	16
Navy Reserves	1
Number with service connection	31
GAF (mean)	73.69

Task 2: Clinical Assessment and Neuroimaging (months 1-21). – **Complete**

All participants will receive extensive diagnostic and clinical assessments, neuropsychological evaluation neuroimaging.

- We have reviewed scoring for the neuropsychological measures and these assessments are currently being scored. All imaging data has been downloaded and anonymized. Back up files for the imaging data have also been created.

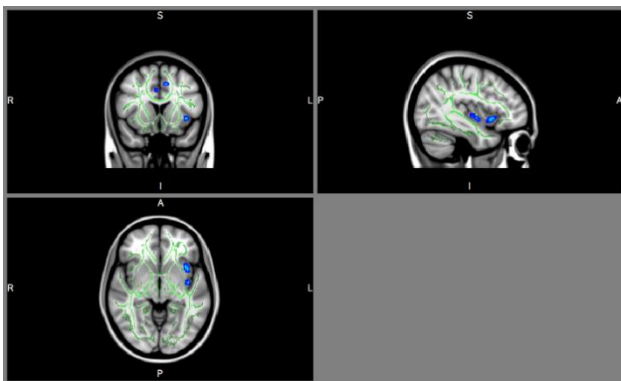
Task 3: Data Collection and Storage (months 1-21). – **Complete**

The study coordinator will ensure all study forms, clinical and neuroimaging data is received in correct form and safely stored.

Phase III. Data Analysis and Reporting (months 1-26). – **In Progress**

Task 1: Analysis of neuroimaging data (1-26 months). An integrity check of the imaging data will be performed during the first 4 months of the proposed project. Processing of the imaging data will begin as soon as the data is collected with more complex imaging analyses occurring in months 9-26. – **In Progress**

- Imaging data for this project included functional magnetic resonance imaging, diffusion tensor imaging, and magnetic resonance spectroscopy. This quarter we have focused on analyses of white matter connectivity using BEDPOSTX (Bayesian Estimation of Diffusion Parameters Obtained using Sampling Techniques), and TBSS software. Since BEDPOSTX required anatomical masks to calculate the connectivity between the regions, T1 images have been processed with Freesurfer to obtain parcellation masks. In the first set of analyses we noted that over 50% of the participants showed no detectable brain connectivity between some key regions. Further investigation of the data indicated that many of the “non-detected” measurements had values with skewed distributions. We have therefore begun reanalysis with BOX-COX transformed data.



- Preliminary analyses of skeletonized FA data from DTI images comparing groups with no suicidal behavior with suicidal behavior covaried for age and sex, suggest that between group differences exist in white matter. These data are currently undergoing additional analyses.

- 1) Brain Morphometric Measures: The first hypothesis we proposed was to test whether Veterans with a history of self-directed violence would demonstrate significant differences in prefrontal neurobiology when compared to Veterans with no history of self-directed violence. We extended the analyses for these hypotheses to include the anterior cingulate.

Table 2: Right Anterior Cingulate Correlations for Ideators

Variables		Buss-Perry Physical	Buss-Perry Verbal	Buss-Perry Anger	Buss-Perry Hostility	Buss-Perry Total
Total Tissue Volume	<i>r</i>	-0.078	0.503	0.501	0.311	0.339
	<i>p</i>	0.69	0.006	0.007	0.107	0.078
Right Anterior Cingulate	<i>r</i>	-0.127	0.066	-0.067	0.039	-0.097
	<i>p</i>	0.520	0.737	0.735	0.846	0.631
CSF	<i>r</i>	-0.125	0.250	0.321	0.458	0.237
	<i>p</i>	0.53	0.199	0.096	0.014	0.226

Further analyses showed that ideators demonstrated significant correlations between whole brain tissue volume and subscales of the Buss Perry. However, no association was evident between anterior cingulate volume and subscales of the Buss Perry.

Table 3: Right Anterior Cingulate Correlations for Attempters

Variables		Buss-Perry Physical	Buss-Perry Verbal	Buss-Perry Anger	Buss-Perry Hostility	Buss-Perry Total
Total Tissue	<i>r</i>	-0.076	0.230	0.182	0.216	0.133
	<i>p</i>	0.74	0.302	0.416	0.334	0.555
Right Anterior Cingulate	<i>r</i>	0.229	0.455	0.372	0.490	0.474
	<i>p</i>	0.305	0.034	0.088	0.020	0.026
CSF	<i>r</i>	-0.112	-0.325	0.358	-0.089	-0.056
	<i>p</i>	0.62	0.140	0.102	0.692	0.804

- Consistent with our study hypotheses, attempters demonstrated significant correlations between anterior cingulate volume and subscales of the Buss Perry. In contrast to ideators, no significant association were evident with whole brain measures.
- Definitions: Total tissue Volume = Gray and white matter. Essentially everything but brain stem, ventricles, CSF, and choroid plexus; Anterior Cingulate; CSF = cerebral spinal fluid in ventricles including left and right lateral and, inferior lateral, 3rd, 4th, 5th ventricles; Buss-Perry is a self-report instrument that measures four aspects of aggression: physical, verbal, anger, and hostility.

- 2) Sex Differences: Our exploration of sex differences within the Veterans also continued. In a sample of MSRC participants combined with participants from an earlier Merit Review grant (Yurgelun-Todd), we examined the association between mood symptoms, aggression, and suicide by sex (Table 4).

Table 4. Clinical and Mood Measure for Female Veterans compared to Male Veterans with MDD/PTSD.

	Females N =47		Males N = 158		
	Mean	SD	Mean	SD	<i>P</i>
GAF	70.33	15.93	70.98	15.69	0.81
HAM-A	8.21	7.36	9.09	9.48	0.54
HAM-D	6.83	5.81	7.73	7.87	0.44
POMS Tension	10.59	7.79	9.48	7.31	0.34
POMS Depression	9.16	10.76	10.66	12.32	0.43
POMS Anger	6.75	6.77	7.88	9.09	0.40
POMS Vigor	17.29	6.99	15.77	6.61	0.15
POMS Fatigue	11.12	7.67	8.77	6.98	0.04
POMS Confusion	8.22	5.58	7.81	5.14	0.63
POMS Total	26.53	34.43	28.78	38.96	0.71
BP Physical Aggression	20.37	14.89	23.86	9.46	0.05
BP Verbal Aggression	12.10	4.21	14.32	4.18	0.001
BP Anger	14.20	5.19	16.37	6.72	0.04
BP Hostility	17.00	6.99	19.70	7.44	0.03
BP Total	63.53	23.24	74.24	21.50	0.003

- Results from these analyses showed that female and male veterans differed significantly on aggressive traits with males reporting higher aggression on every scale of the BPAQ. Males reported higher levels of physical aggression, verbal aggression, anger, hostility, and total aggression compared to females (Table 4). Interestingly, aggression was associated with lifetime suicidal behaviors including ideation and attempts differently by group. For males, lifetime suicidal behavior including ideation and attempts was correlated with physical aggression ($p = 0.001$, $r = 0.26$), verbal aggression ($p = 0.04$, $r = 0.16$), anger ($p < 0.001$, $r = 0.42$), hostility ($p < 0.001$, $r = 0.46$), and total aggression ($p < 0.001$, $r = 0.44$). However, for females lifetime suicidal ideation was related only to hostility ($p = 0.01$, $r = 0.37$). For both males and females, lifetime suicidal ideation was correlated with symptoms of anxiety (HAM-A male $p < 0.001$, $r = 0.42$; female $p = 0.002$, $r = 0.44$) and depression (HAM-D male $p < 0.001$, $r = 0.54$; female $p < 0.001$, $r = 0.55$). There were no between-group differences in measures of suicidal behaviors or in anxious or depressive symptoms.

- These findings suggest important differences in the association between aggressive traits and suicidal behavior by sex with male aggressive traits related to suicidal behaviors, while female aggressive traits were not. Additionally, males and females differed significantly on ratings of aggressive traits but not on measures of suicidal behaviors, anxious, or depressive symptoms. Prior research has shown sex differences in functional connectivity when aggression is related to connectivity between the orbitofrontal cortex (OFC) and other brain regions (McGlade, Rogowska, & Yurgelun-Todd, 2015). This neuroimaging and clinical data suggest unique neurobiological patterns may underlie the observed sex associated clinical differences. These data have significant clinical implications, as males with aggressive traits including urges to strike people, engaging in frequent arguments, and trouble controlling one's temper may be more likely to also endorse suicidal ideation and attempts. Further it appears that females who endorse high levels of hostility such as feeling like others are talking or laughing at them behind their backs, that others have been more unfairly fortunate, or feeling very bitter/jealous, may be more likely to endorse suicidal ideation or attempts. Additional studies are needed to further explore neurobiological differences underlying these sex differences. (McGlade 2016, in preparation).

Task 2: Analysis of clinical data (months 5-26). Statistical analysis of the clinical data will be performed beginning in the 5th month of study and be completed by the 26th month of the study. – **In Progress**

- Self-directed violence and associated sequelae were a primary focus of this project. 29/81 participants (35.8%) reported no history of self-directed violence (SDV = suicidal ideation or suicide attempts) whereas 52/81 (64.2%) reported a history of SDV. Of the individuals who reported a history of SDV, 51/52 (98%) reported suicidal ideation and 23/52 (44%) reported a history of suicide attempt(s). Thirteen participants reported a history of suicide attempt(s), nine people reported a history of an interrupted suicide attempt, and twelve people reported a history of an aborted suicide attempt(s). Within the group with a history of suicide attempts, the mean number of suicide attempts was 3.15 (range 1-12, SD = 3.23); mean number of interrupted attempts was 1 (range = 1, SD = 0.00), and mean number of aborted suicide attempts was 1.75 (range = 1-4, SD = 0.97).

Task 3: Presentations and publications (months 9-26). Team members will present preliminary data at conferences and finalize and publish manuscripts of the results by the end of the 26th month. – **In Progress**

Task 4: Application for further funding (months 21-26): Applications for further funding will occur during the last 6 months. – **In Progress**

Final report will be submitted to the MSRC no later than December 27, 2016

A5 Toward a Gold Standard for Suicide Risk Assessment for Military Personnel Peter M. Gutierrez, Ph.D. & Thomas Joiner, Ph.D.

Task 1. Hire and train staff (timeframe, months 1-4):

1a. Hire and train project coordinators at MIRECC and FSU (timeframe, months 1-2).

(Completed)

1b. Hire and train site assessors (timeframe, months 3-4). **(Completed)**

Four full-time SAs have been fully trained on study procedures.

Task 2. Begin and complete baseline data collection; start longitudinal tracking (timeframe, months 4-57):

2a. Begin baseline data collection (timeframe, month 4). **(Completed)**

Data collection is underway at all sites

2b. Continue and complete baseline data collection (timeframe, months 4-57). **(In Progress)**

2c. Begin longitudinal tracking (timeframe, months 4-57). **(Completed)**

Task 3. Continue and complete longitudinal tracking (timeframe, months 24-60):

3a. Continue longitudinal tracking (timeframe, months 24-60). **(In Progress)**

3b. Complete longitudinal tracking (timeframe, month 60).

Task 4. Data analysis; manuscript and report writing (completed after month 60):

4a. Complete data analyses.

4b. Manuscript and report writing.

TOTAL	Enrolled	Follow-ups Completed
Total	857	539

Other Progress

A collaboration has been agreed upon between the Israel Defense Forces Suicide Prevention Team and the Gold Standard study team. Dr. Leah Shelef is an IDF psychologist currently running a study using the C-SSRS and BSS. Dr. Shelef has added the SHBQ and SBQ-R to their assessment study protocol. Dr. Shelef has completed data collection with a total of 65 participants enrolled. Manuscript ideas are currently being discussed.

Retention rates have continued to increase. The current retention rate is 69.2%.

The study team was approved for a 2nd NCE. With this NCE the study team anticipates reaching the goal of 700 follow-ups.

A6 A Novel Approach to Identifying Behavioral and Neural Markers of Active Suicidal Ideation: Effects of Cognitive and Emotional Stress on Working Memory in OEF/OIF/OND Veterans
Melissa Amick, Ph.D. & Beeta Homaifar, Ph.D.

Objective 1: Create infrastructure for study implementation and execution – **Complete**

Task 1: Build infrastructure, obtain regulatory approval for both sites, hire and train personnel, acquire measures, create database (Quarter 1-2)

- All staff has been identified, hired, and fully trained on the research protocols.
- All measures have been obtained and are in use.

Objective 2: Conduct study –**In Progress**

Task 2: Recruit and consent participants (Quarters 3-6)

- Recruitment efforts are active and ongoing according to the recruitment plan.
- Data collection has begun, with complete data obtained on all measures for 41 participants.
- The primary outcome measure was developed, programmed, piloted, and has successfully obtained data for incoming participants.
- The database was completed and is in place as data entry continues with participant enrollment. All data has been entered to n=41 (42 enrolled/consented and one excluded; MRI data has been processed to n=31).

Task 3: Execute post neuroimaging processing

- Initial analyses have begun on the functional and structural neuroimaging data, including image preprocessing and script development.

Recruitment and Enrollment Numbers:

Screened through TRACTS dataset: 506

Screened in CPRS Medical Records (Brockton inpatient unit and physician referrals): 698

Total screened: 1204

Attempted contact by phone/in person: 190

Successful phone contact and screening: 91

Screened in person after TRACTS visit: 11

Enrolled: 42

We are reserving declaration of findings until data collection is complete to n=90, data has been analyzed, and the results have been interpreted. The study team was approved for a second NCE to attain recruitment goals.

A7 Home-Based Mental Health Evaluation (HOME) to Assist Suicidal Veterans with the Transition from Inpatient to Outpatient Settings: A Multi-site Interventional Trial

Bridget Matarazzo, Psy.D.

Specific Aim 1: Prepare HOME for Project Interventional Trial - **Complete**

Task 1: Build infrastructure for project - **Complete**

- Full regulatory approval has been obtained at all sites. The study is currently progressing according to the Statement of Work.

Specific Aim 2: Conduct HOME Project Interventional Trial –**Complete**

Task 2: Recruit and consent participants for interventional trial; collect and enter Time 1 data

Task 3: Conduct HOME intervention at active sites and complete Time 2 data collection

Task 4: Complete Time 3 data collection

Task 5: Complete Time 4 data collection

The HOME trial completed recruitment, delivering the HOME intervention at active sites, and collecting and entering data from all assessment times for all sites

Recruitment numbers are as follows:

	Total N	%	Denver	Philadelphia	Houston	Portland
Screens completed*	6347	-	922	1851	2190	1384
Screened out	5815	91.62%	750	1750	2058	1257
Screened in	532	8.38%	172	101	132	127
Declined	182	34.21%	60	22	53	47
Enrolled	323	60.71%	108	71	70	74
Withdrew	21	6.50%	7	6	4	4
Completed study**	109	33.75%	42	13	22	32

**All patients admitted to the psychiatric inpatient unit at each site are potentially eligible for the study and are screened through review of the medical record for additional eligibility criteria (e.g., safety, suicidal ideation, etc.). As such, large numbers of “potential participants” are screened for this study.*

***109 participants completed the Time 4 follow-up assessment, which relates to secondary and exploratory outcomes. Data for primary outcomes is pulled from the medical record; thus, will be available for all participants.*

Due to the approval of a second no-cost extension, the Statement of Work has been extended. Next year tasks include:

- Data analyzed and results interpreted
- Findings disseminated to scientific community via presentation at 2 scientific conferences; submission of 2 manuscripts for publication; study information posted on MIRECC website
- Findings disseminated to study participants via newsletter or postcard
- Findings disseminated to VA and DoD providers and policy makers via presentations, webinars, and/or electronic newsletters
- Final reports successfully submitted

A8 Warning Signs for Suicide Attempts

Courtney Bagge, Ph.D. & Ken Conner, Psy.D., MPH

Task 1. Hire and train staff (timeframe, months 0-3): -Complete

1a. Hire and train project coordinators/assessors (timeframe, months 0-3).

Task 2. Creation of an interviewer-administrated computerized follow-back interview - Complete

2a. Hire programmer and create interview (timeframe, months 0-1.5).

2b. Test and finalize interview (timeframe, months 1.5-2.5).

- Administering Self-Report Data and Common Data Elements: Three additional personnel were added to the project to aid in administering the self-report battery. All site interviewers have practiced the self-report packet and script for administering this battery. These practice sessions continued until the individual interviewer started data collection.
- Facilitating data accuracy: Double entry was completed by individuals at all sites, and UMMC personnel ran data comparison reports to check for accuracy. Feedback for sites was compiled by UMMC and provided to trainers of other sites.
- Practicing the TLFB interviews (role plays) with UMMC staff: For the past three months, all sites attended weekly virtual meetings with UMMC staff and practiced giving the TLFB interview
- Engage in Meta-Supervision Feedback on Practice TLFB Interviews with UMMC staff: For the past three months, all site interviewers received meta-supervision feedback via telephone and email after each practice TLFB interview. All trainees are signed-off to initial fidelity standards and can complete the TLFB with participants.
- Adverse Event Decision Making Tool: CoE developed a Significant Adverse Event decision making tool this quarter, disseminated this to sites, and provided training during monthly calls on identifying and reporting adverse events. This tool has streamlined and clarified the process for reporting adverse events to CoE, MSRC, and HRPO.
- VAMC Treatment History Data Collection from Medical Records: An electronic data collection tool was developed and pilot tested with sites this quarter for use in collecting the study wide, current admission medical records data. All VAMC sites have received training on collecting medical chart and treatment history data.
- Study Wide Current Admission Medical Chart: A “Guide for Chart Abstraction” was developed by the CoE Coordinator with input from Dr. Conner and UMMC staff, during Q4. Effort was extended to further train staff in use of an electronic version of the study wide/current admission chart abstraction tool. VA sites are getting started with data collection and at this time have not yet received medical records data from the VA sites.

Task 3. Begin and complete data collection (timeframe, months 3-22): - In Progress

3a. Complete data collection (timeframe, month 3-22).

3b. Complete fidelity checks of data (timeframe, months 3-22).

Recruitment

- Time in the Field (from kickoff meeting [final approvals met] to year-end [or site closure if earlier than year-end date])
 - UMMC: 832 days
 - Rochester: 282 days

- Seattle: 751 days
- San Diego: 419 days
- Arkansas: 218 days
- Final Enrollment
 - As of 9/15/2016, 406 participants provided at least partial data and 363 participants (89%) fully completed all assessments. We have just finished data collection and our recruitment goal was met for obtaining fully complete data (n=363) for analysis. Below are the recruitment statistics for the study.

Grant Total Including all sites	Eligible N	Consented N	% Consented out of Eligible	Fully Completed All Assessments N	% Fully Completed out of Consented
363	474	410	86.5%	363	88.5%

*Note, 4 participants consented but did not provide any data.

Fidelity of Interviews of Participants and Consultation with UMMC Regarding Study Procedures:

- All trainees have consulted with UMMC staff via telephone and email regarding eligibility status and questions regarding participant tracking and study procedures.
- Each TLFB interview and audio is currently being reviewed by the Fidelity Coordinator and discussed with Dr. Schumacher to ascertain fidelity ratings. This is still in progress.
- Trainees routinely met virtually with the Fidelity Coordinator to review their fidelity ratings on the TLFB with real participants and to receive meta-supervision in order to troubleshoot strategies to help facilitate interviews with difficult participants.

Meetings Between Sites and Recruitment and Data Tracking:

Routine meetings occurred with at least one (usually two representatives from each site). The monthly numbers were reviewed during site meetings. The UMMC coordinators, CoE coordinator, and PI also conducted ad hoc meetings by phone and addressed questions from sites by email on a frequent basis.

We have just finished the original data collection, with no results as of yet. We met our goal of collecting fully complete and intensive data from 363 participants. Fidelity and reliability TLFB ratings, coding of TLFB original, fidelity, and reliability data, variable creation, cleaning, and comparison across TLFB datasets continues at UMMC for the no cost extension year. After 9/22/16, the CoE will remain open to facilitate IRB and HRPO submissions, hold the certificate of confidentiality, and report adverse events (although data collection has ceased). The CoE's effort will be *in kind*.

Moving Beyond Self-Report: Implicit Associations about Death/Life Prospectively Predict Suicidal Behavior among Veterans

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Reliance on self-report limits clinicians' ability to accurately predict suicidal behavior. In this study the predictive validity of an objective measure, the death/suicide Implicit Association Test (d/sIAT), was tested among psychiatrically hospitalized veterans. Following acute stabilization, 176 participants completed the d/sIAT and traditional suicide risk assessments. Participants had similar d/sIAT scores regardless of whether they had recently attempted suicide. However, d/sIAT scores significantly predicted suicide attempts during the 6-month follow-up above and beyond other known risk factors for suicidal behavior (OR = 1.89; 95% CI: 1.15–3.12; based on 1SD increase). The d/sIAT may augment the accuracy of suicide risk assessment.

Accurately assessing suicide risk is extremely difficult. Current suicide risk screening and assessment methods rely almost entirely on patient self-report of suicidal thoughts and intentions, which is

problematic for a number of reasons. Suicidal individuals are often motivated to minimize the report of their actual suicidal ideation or intentions to avoid psychiatric hospitalization or facilitate discharge from

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such settings (Nock & Banaji, 2007). People also often have limited insight into their thoughts and feelings, which can impact their ability to accurately report suicidal ideation and intentions (Wilson, 2009). Furthermore, many patients experience transient suicidal thoughts and intentions that may be absent during a clinical interview, but then rapidly resurface under stress (Nock, Prinstein, & Sterba, 2009). In a prospective study of psychiatric inpatients, Busch, Fawcett, and Jacobs (2003) found that 78% of individuals who died by suicide as an inpatient or immediately following discharge had denied suicide ideation or intent in their last communication. Similarly, 73% of Veterans Health Administration (VHA) patients who died by suicide did not report suicide ideation when assessed within a week of their death (Smith et al., 2013). Indeed, many studies have found the highest risk of death by suicide occurs immediately following inpatient discharge (e.g., Hunt et al., 2009; Valenstein et al., 2009), presumably after patients deny suicidal intent (Nock & Banaji, 2007).

Even among patients who accurately report current suicidal ideation and intentions, determining which of these individuals will go on to engage in suicidal behavior remains extremely challenging (Fowler, 2012; Silverman & Berman, 2014). Despite decades of research, no method of suicide risk assessment currently has the capacity to adequately predict who will engage in suicidal behavior (Fowler, 2012; Franklin et al., 2016). To overcome these limitations, more work is needed to identify behavioral markers of suicide risk and recovery. The development and validation of objective measures to assess implicit cognitions and processes specific to suicide is an emerging line of research that holds great promise. A nascent literature suggests that assessing patients' implicit associations regarding death and life using performance-based, reaction-time tasks may circumvent some of the limitations of self-report measures by providing a more objective assessment of suicide risk. Specifically,

Nock et al. (2010) have developed a suicide-related version of the Implicit Association Test (IAT; Greenwald, McGhee, & Schwartz, 1998) that assesses individuals' unconscious associations between themselves and life and death, the "death/suicide IAT" (d/sIAT). Several studies have demonstrated a relation between d/sIAT scores and concurrent or past suicidal thoughts, intentions, and behaviors (Harrison, Stritzke, Fay, Ellison, & Hudaib, 2014; Nock et al., 2010; Randall, Rowe, Dong, Nock, & Colman, 2013). Similarly, Ellis, Rufino, and Green (2016) found that d/sIAT scores upon admission to a psychiatric inpatient unit predict suicide ideation at discharge. Moreover, two studies focused on psychiatric emergency room patients have demonstrated the incremental predictive validity of the d/sIAT for predicting self-harm (Nock et al., 2010; Randall et al., 2013). Nock and colleagues found that positive associations between self and death among participants with a history of a suicide attempt were associated with a sixfold increase in the risk of a suicide attempt during a 6-month follow-up, even after controlling for other primary predictors of suicide risk, including presence of a current depressive disorder, a history of multiple suicide attempts, severity of suicide ideation, and clinician and patient prediction. This effect of d/sIAT scores incrementally predicting self-harm behavior was replicated by Randall et al. (2013); however, nonsuicidal self-injury was not differentiated from suicidal self-injury in that study. Despite these promising findings, no other studies have evaluated the prospective predictive validity of the d/sIAT for suicide attempts or deaths. Researchers still need to evaluate the generalizability of these findings to other patient populations at risk for suicide (e.g., veterans) and in care settings besides emergency departments.

The purpose of the current research was to test the validity of the d/sIAT as a marker of suicide risk among veterans admitted to a psychiatric inpatient unit. Following the design of Nock et al. (2010), the primary objectives of this study were to determine if the d/sIAT could (1) be used

to detect recent suicide attempt status in a sample of veterans admitted to an inpatient psychiatric unit due to imminent suicide risk, and (2) prospectively predict suicide attempts during a 6-month follow-up above and beyond other known risk factors. We hypothesized that higher scores on the d/sIAT (stronger association between self and death/weaker associations between self and life) would be associated with: (1) significantly greater odds of having made a suicide attempt in the week prior to admission and (2) significantly greater odds of making a suicide attempt in the next 6 months, above and beyond the influence of other known risk factors for suicidal behavior (i.e., demographic factors, diagnosis, history of multiple suicide attempts, severity of suicide ideation, and clinician and patient prediction).

METHOD

Design

Eligible patients included all veterans between the ages of 18 and 89 years old who were currently hospitalized due to suicide risk (as documented in admission notes) in a VHA psychiatric inpatient unit at an urban Veterans Affairs Medical Center. Veterans were excluded from study participation if they were unable to provide informed consent and complete study measures (e.g., due to extreme distress, mania, sedation, cognitive deficits, etc. based on the charge nurse's and experimenter's evaluation). The single-arm, longitudinal study consisted of a baseline assessment while the participants were hospitalized and a follow-up assessment/medical record review 6 months later.

Participants

We enrolled 176 veterans in this study. One participant was excluded after revealing information during his baseline session that met exclusion criteria. Two additional participants were excluded from

d/sIAT analyses; one due to slow and random responses on the d/sIAT and one due to loss of data during a technical malfunction. Baseline analyses for the first hypothesis therefore included 173 participants. An additional nine participants were lost to follow-up and one participant declined to provide a prediction of his/her likelihood of attempting suicide within the next 6 months. This left 163 participants in the follow-up sample. There were no significant differences between the 12 eligible participants who were not included in the follow-up sample and participants who completed the study (results available upon request). The majority of participants were White males with a median age of 50 years (range = 21–88; Table 1). Over two-thirds of participants had a history of one or more suicide attempts.

Measurement

We used the same measures as Nock et al. (2010). In addition to the measures described here, at the end of the baseline assessment session study participants completed several self-report measures for use in exploratory research.

Implicit Associations of Self with Death/Life. The Death/Suicide Implicit Association Test (d/sIAT) was used to assess the relative strength of the respondent's tendency to associate death or life with themselves. The d/sIAT achieves this by measuring participants' reaction times on a computerized semantic categorization task. Participants classify stimuli representing the constructs of "death" (i.e., suicide, die, funeral, lifeless, deceased) and "life" (i.e., alive, live, thrive, survive, breathing), and the attributes "me" (i.e., myself, my, mine, I, self) and "not me" (i.e., them, they, theirs, their, other). On critical trials of the d/sIAT, pairs of constructs and attributes appear in each upper corner of the screen. Stimuli appear in the lower center of the screen and respondents categorize the words to the right or left depending on the construct/attribute pairs in the top corners of the screen. Faster responses on the

TABLE 1
Baseline Sample's Characteristics and Primary Predictors of Suicide Attempts

Characteristic	Participants with recent attempt ($n = 44$)		Participants without recent attempt ($n = 129$)		Test statistic	Effect size Cohen's d or Cramer's v	p Value Chi-square or t test
	Mean (SD) and Median (range) or n (%)	Mean (SD) and Median (range) or n (%)	Mean (SD) and Median (range) or n (%)	Mean (SD) and Median (range) or n (%)			
Age	49.0 (12.3) 52 (21, 67) 41 (93%)	45.6 (14.4) 48 (22, 88) 121 (94%)			1.4	0.24	0.17
Male					n/a	<0.0001*	>0.99*
Race/ethnicity					n/a	0.09*	0.25*
Caucasian	25 (57%)	89 (69%)					
African American	9 (20%)	21 (16%)					
Latino/Latina	7 (16%)	8 (6%)					
Multiple	2 (5%)	9 (7%)					
Other	1 (2%)	2 (2%)					
Marital status					3.2	0.13	0.34
Never married	14 (32%)	36 (28%)					
Partnered or married	6 (14%)	35 (27%)					
Separated	5 (11%)	12 (9%)					
Divorced/widowed	19 (43%)	44 (36%)					
Diagnosis							
Depressive disorder	34 (77%)	102 (79%)			0.06	0.02	0.80
Anxiety disorder	24 (55%)	83 (64%)			1.3	0.09	0.25
Alcohol-use disorder	25 (57%)	57 (44%)			2.1	0.11	0.15
Substance-use disorder	27 (61%)	50 (39%)			6.8	0.20	0.009
Psychotic disorder	7 (16%)	12 (9%)			n/a	0.09*	0.26*
Other disorder	5 (11%)	18 (14%)			0.19	0.03	0.66
Past suicide attempts					10.5	0.25	0.005
No attempt	9 (20%)	47 (36%)					
One attempt	7 (16%)	36 (28%)					
Multiple attempts	28 (64%)	46 (36%)					
BSS scores ($n = 172$)	15.7 (10.4) 18 (0, 31) -0.44 (0.44)	13.1 (8.9) 14 (0, 36) -0.48 (0.39)			1.6	0.28	0.12
d/sIAT scores					0.60	0.10	0.55

Note. BSS, Beck Scale for Suicide Ideation; "Past Suicide Attempts" do not include "Recent Attempts" prior to hospital admission.
 * $r_{\text{equivalent}}$ (Rosenthal & Rubin, 2003) and Fisher's exact test.

“death”/“me” blocks relative to the “life”/“me” blocks have been associated with increased suicide risk (Nock et al., 2010). We utilized the same code and presentation program (Inquisit 3.0, Millisecond Software, Seattle, WA, 2012) as Nock et al. (2010). The d/sIAT was presented on a laptop computer with a 15.6 inch screen.

Participant Demographic and Psychiatric Factors. VHA electronic medical records were reviewed to collect demographic and psychiatric risk factors for suicide attempts. This included age, sex, race, and mental health diagnoses listed in discharge reports.

History of Suicidal Behavior. The Self-Injurious Thoughts and Behaviors Interview (SITBI; Nock, Holmberg, Photos, & Michel, 2007), a structured clinical interview, was used to assess past and current suicide ideation, plans, and attempts. The SITBI defines *suicide* as “an actual attempt to kill yourself in which you had at least some intent to die.” The SITBI has good reliability and validity (Nock et al. 2010). Study staff administered the SITBI during the baseline assessment. Suicide attempt status prior to the baseline assessment (i.e., whether the participant attempted suicide in the week prior to admission) was determined by self-report on the SITBI.

Severity of Current Suicide Ideation. The Beck Scale for Suicide Ideation (BSS; Beck & Steer, 1991) was used to measure the severity of suicide ideation during the week prior to the baseline assessment. The BSS has 21 self-report items each consisting of three statements in order of increasing severity (0 = *least severe* to 2 = *most severe*). Respondents select the statement that best describes their feelings. Only items 1 through 19 are used to calculate the total scale score. The scale has high concurrent validity (comparing patient and psychiatrist ratings: .90, $p < .001$) and internal consistency ($\alpha = .93$; Beck, Steer, & Ranieri, 1993).

Clinician and Participant Predictions. Each participant’s primary psychiatrist answered the following question: “Based

on your clinical judgment and all that you know of this patient, if untreated what is the likelihood that this patient will make a suicide attempt in the next 6 months?” Psychiatrists responded using an 11-point Likert-type scale with 0 being *no likelihood* and 10 being *very high likelihood* (c.f., Nock et al., 2010). An item on the SITBI was used to ascertain each participant’s own prediction of the likelihood they would attempt suicide during the follow-up period. Participants were asked, “On the scale of 0–4, what do you think the likelihood is that you will make a suicide attempt in the future?” The Likert-type scale ranged from 0 (*low/little*) to 4 (*very much/severe*).

Suicide Attempts During the 6-Month Follow-Up. Participants were contacted 6 months after their baseline assessment session and re-administered the SITBI. Follow-up suicide attempt status (i.e., whether the participant had attempted suicide during the follow-up period, including participants who died by suicide) was determined by a combination of self-report on the SITBI and medical record review (c.f., Nock et al., 2010). Approximately 55% of participants took part in the follow-up SITBI. Medical records were considered to be “positive” for a suicide attempt if a new suicide attempt occurring during the follow-up period was documented in the chart. If the medical record included documentation of a suicide risk assessment occurring at least 5 months after the baseline assessment session and suicide attempts were denied, the medical record was coded as “negative” for a suicide attempt. If a veteran was in VA residential care (e.g., domiciliary, substance abuse treatment program) that included regular clinical contact, and there was no documentation of suicidal behavior, the medical record was coded as “negative” for suicide attempt. If the medical record did not include documentation of a suicide attempt or assessment of suicide risk and the veteran had not been in residential care, the medical record was coded as “missing” suicide attempt data. When either the SITBI or sufficient chart data were missing, the other

was used to determine the follow-up attempt status. Using this method, we were still unable to determine the follow-up suicide attempt status for nine participants. If the participant's self-report and chart data conflicted, the discrepancy was clarified. The first and second authors reviewed and discussed any instances of questionable suicidal behavior (e.g., attempt vs. preparatory behavior) and classified it based on the SITBI and the Self Directed Violence Classification System (Brenner et al., 2011).

Procedure

Clinicians on the inpatient psychiatric unit notified potentially eligible patients about the study and referred interested patients to study staff. Study staff reviewed the patients' medical records and discussed their capacity to participate in the research with the referring provider and charge nurse. When the treatment providers believed that the patient was emotionally stable enough to participate in the baseline assessment, study staff met with the patient, discussed the details of the study with them, assessed their capacity to provide informed consent, and—if appropriate—the patient enrolled in the study. Participants were enrolled in the study as soon as possible following hospital admission. The baseline assessment session lasted approximately 1 hour, and participants were compensated \$25. Participants began by completing the d/sIAT, followed by the SITBI and BSS. All participants were reminded that they would be called on the telephone in approximately 6 months to complete the follow-up SITBI. Participants did not receive additional compensation for completing the follow-up assessment.

Analyses

Demographic and clinical characteristics are reported as means and *SDs*, medians and ranges, and counts and percents, as appropriate. IAT *D* scores were calculated using the improved algorithm as described

by Greenwald, Nosek, and Banaji (2003) with the following “approximately equivalent alternatives” added: (1) delete trials with latencies below 400 milliseconds and (2) for errors, do not add time to error latencies given that the program requires a correct response after an error. A hierarchical logistic regression analysis was used to test the hypothesis that higher IAT scores would be associated with significantly greater odds of having made a suicide attempt within the week prior to admission. In order to determine which variables to include in the final regression model as potential confounders, we identified variables significantly related to suicide attempt status, independent of IAT scores ($p < .05$). The variables considered were age, race/ethnicity, marital status, diagnosis, history of suicide attempts, and severity of suicide ideation. The potential confounders identified were entered in the first step of the logistic regression, and the IAT scores were entered in the second step.

A hierarchical logistic regression analysis using forward stepwise entry into three blocks was used to test the hypothesis that higher scores on the suicide IAT would be associated with significantly greater odds of making a suicide attempt in the next 6 months, above and beyond the influence of other known risk factors for suicidal behavior. Similar to Nock et al.'s (2010) analyses, block one consisted of potential predictors associated with follow-up attempt ($p < .05$). The variables assessed included age, race/ethnicity, marital status, diagnosis, history of suicide attempts, and severity of suicide ideation. Psychiatrist and participant predictions were entered in block two, and IAT scores were entered in the third block. In order to increase the generalizability of the findings to all veterans admitted to inpatient care due to suicide risk, we chose to include veterans both with and without a history of suicide, whereas past research has focused on the incremental predictive validity of the d/sIAT among participants with a history of one or more lifetime suicide attempts (Nock et al. 2010).

RESULTS

Baseline Results

Participants who attempted suicide in the week prior to admission did not differ from participants who had not attempted suicide in the week prior to admission on age, sex, or race. Both groups had similar BSS scores and diagnoses (Table 1), with the exception that participants who attempted suicide in the week prior to admission were more likely to have a substance-use disorder and a history of multiple previous suicide attempts (excluding attempts in the week prior to admission). Participants had similar d/sIAT scores regardless of whether they had attempted suicide in the week prior to admission. A hierarchical logistic regression accounting for substance-use disorders and previous suicide attempts failed to support the first hypothesis that participants with higher d/sIAT scores (i.e., stronger implicit associations between self and death and weaker implicit associations between self and life) would have significantly greater odds of having made a suicide attempt in the week prior to admission (Table 2).

Follow-Up Results

Twenty-seven participants attempted suicide at least once within 6 months of the baseline assessment. The primary factors traditionally used in suicide risk assessment were analyzed for differences between the group of participants who attempted suicide during the follow-up period and those who did not (Table 3). There were no significant differences in demographic or psychiatric variables between groups, with the exception of age. Participants who attempted suicide during the follow-up tended to be younger than participants who did not attempt suicide during the follow-up. Mental health diagnoses and history of previous suicide attempts were similar across groups. Participants and clinicians predicted a significantly higher likelihood of suicide among participants who went on to attempt suicide during

the follow-up period. These participants also had significantly higher scores on the d/sIAT than participants who did not attempt suicide during the follow-up period.

A hierarchical logistic regression was used to test the incremental predictive validity of the d/sIAT to predict suicide attempts even after accounting for the principal suicide risk factors that were significantly related to suicide attempt status at follow-up (Table 4). In support of the second hypothesis, d/sIAT scores significantly predicted suicide attempts during the follow-up period above and beyond age, patient predictions, and clinician predictions, with a one standard deviation increase in d/sIAT score associated with an 89% increase in the likelihood of a suicide attempt during the next 6 months.

DISCUSSION

This study provides additional support for the incremental predictive validity of the d/sIAT. Our findings not only replicate those of Nock et al. (2010), but also extend the findings to a sample of veterans in a psychiatric inpatient setting. Specifically, in our sample, d/sIAT scores explained an additional 4.6% of the variance in suicide attempts during the 6-month follow-up period, after accounting for principal suicide risk factors significantly associated with these attempts. Veterans with higher d/sIAT scores (stronger associations between self and death compared with associations between self and life) were almost twice as likely to attempt suicide during the 6-month follow-up period. Moreover, these analyses included both participants with and without a history of a suicide attempt, whereas past research has focused on the incremental predictive validity of the d/sIAT only among participants with a history of one or more suicide attempts (Nock et al. 2010). It is also notable that d/sIAT scores predicted future suicide attempts when many of the “best” self-reported indicators of suicide risk failed to do so (i.e., history of suicide attempt, severity of suicide ideation). Given the somewhat

TABLE 2*Test of Hypothesis One: d/sIAT Scores and Recent Suicide Attempts*

HLR step and variable(s)	<i>b</i> (SE)	OR (95% CI)	R_L^2	Incremental R_L^2	Likelihood ratio test	<i>p</i> Value
Step 1			0.077	0.077	15.09	0.002
Substance-use disorder	0.79 (0.37)	2.21 (1.07, 4.56)				
Prior attempts						
No prior attempts	Reference					
One prior attempt	−0.39 (0.32)	0.92 (0.31, 2.75)				
Multiple prior attempts	0.70 (0.25)	2.75 (1.15, 6.57)				
Step 2			0.080	0.003	0.51	0.48
IAT D score	0.32 (0.45)	1.14 (0.80, 1.62) ^a				

Odds ratio (OR) based on a 0.40 unit increase in d/sIAT score (about 1 standard deviation).

modest increase in suicide risk accounted for by d/sIAT scores, it is unlikely that the d/sIAT will eliminate the need for traditional self-report assessment techniques. Rather, the most promising use of the d/sIAT may be as one component of a larger suicide risk assessment battery (Randall et al., 2013). Nevertheless, these findings together with those of Nock and colleagues provide a compelling justification for future research examining how the d/sIAT may be used clinically to enhance suicide risk assessment.

Given that the d/sIAT predicted suicide attempts, it is interesting that d/sIAT scores were similar among participants regardless of whether they had attempted suicide within the week prior to admission. This null finding is inconsistent with Nock et al. (2010) results, which demonstrated higher d/sIAT scores among participants who attempted prior to admission. The discrepant level of variability in suicide risk between the two samples may explain the inconsistent findings. Nock and colleagues compared participants with recent attempts to other psychiatrically distressed participants presenting for emergency care. Some of these participants were not seeking care due to concerns of suicide. Additionally, unlike some of Nock and colleagues' participants who presented for emergency care due to suicide risk, but were not admitted, all of the participants in the current study were

believed to be at high enough risk to warrant admission. The resulting sample had a very high prevalence of past suicide attempts (68%). This may have limited variability in underlying suicide risk and reduced the variability accounted for by recent suicide attempts. Indeed, lifetime history of suicide attempts did not predict attempts during the 6-month follow-up.

The Cognitive Model of Suicidal Behavior (CMSB) may offer another potential explanation as to why attempts just prior to admission were not associated with higher d/sIAT scores. The theory holds that dormant schema, or maladaptive cognition and biased information processing, need to be activated by stress in order to influence cognition and imminent suicide risk (Wenzel & Beck, 2008). Nock et al. (2010) participants were assessed in emergency rooms—presumably near the height of a suicidal crisis when maladaptive self-associations with death may have been most fully activated. In the current sample, activation related to stressors precipitating hospitalization might have dissipated somewhat by the time participants were assessed several days (median = 3 days) after admission, leading to similar d/sIAT scores regardless of attempts prior to admission. The potential for decreased activation of maladaptive cognition following psychiatric hospitalization is supported by Russ, Kashdan, Pollack, and Bajmakovic-Kacilas' (1999)

TABLE 3
Follow-Up Sample's Characteristics and Primary Predictors of Suicide Attempts

Characteristics and primary predictors of suicide attempts	Those with a follow-up attempt ($n = 27$)		Those without a follow-up attempt ($n = 136$)		Test statistic	Effect size		p Value
	Mean (SD) and Median (range) or n (%)	Mean (SD) and Median (range) or n (%)	Mean (SD) and Median (range) or n (%)	Mean (SD) and Median (range) or n (%)		Cohen's d or Cramer's v	Chi-square or t test	
Age	42.0 (13.2)	47.9 (13.7)	47.9 (13.7)	51.5 (24, 88)	2.0	0.43	0.04	
Male	39 (21, 65)	51.5 (24, 88)	51.5 (24, 88)	128 (94%)	n/a	0.03*	0.67*	
Race/ethnicity	25 (93%)	128 (94%)	128 (94%)		n/a	0.02*	0.79*	
Caucasian	20 (74%)	87 (64%)	87 (64%)					
African American	3 (11%)	25 (18%)	25 (18%)					
Hispanic	3 (11%)	11 (8%)	11 (8%)					
Multiple	1 (4%)	10 (7%)	10 (7%)					
Other	0 (0%)	3 (2%)	3 (2%)					
Disorder								
Depressive	24 (89%)	103 (76%)	103 (76%)		2.3	0.12	0.13	
Anxiety	18 (67%)	81 (60%)	81 (60%)		0.48	0.05	0.49	
Alcohol use	14 (52%)	63 (46%)	63 (46%)		0.28	0.04	0.60	
Substance use	13 (48%)	58 (43%)	58 (43%)		0.28	0.04	0.60	
Psychotic	4 (15%)	15 (11%)	15 (11%)		n/a	0.05*	0.52*	
Other	3 (11%)	19 (14%)	19 (14%)		n/a	<0.0001*	>0.99*	
Past attempts					3.8	0.15	0.15	
No attempt	4 (15%)	39 (29%)	39 (29%)					
One attempt	6 (22%)	38 (28%)	38 (28%)					
Multiple attempts	17 (63%)	59 (43%)	59 (43%)					
BSS score	16.5 (9.5)	13.2 (9.2)	13.2 (9.2)		1.7	0.35	0.10	
($n = 26$ in attempt group)	19 (0, 31)	14.5 (0, 36)	14.5 (0, 36)					
Patient prediction	2.0 (1.4)	1.1 (1.3)	1.1 (1.3)		3.2	0.68	0.002	
Clinician prediction	8.1 (2.1)	6.2 (2.4)	6.2 (2.4)		3.9	0.82	0.0002	
d/sIAT score	-0.29 (0.41)	-0.50 (0.39)	-0.50 (0.39)		2.5	0.53	0.01	

Note. BSS, Beck Scale for Suicide Ideation.

* $r_{\text{equivalent}}$ (Rosenthal & Rubin, 2003) and Fisher's exact test.

TABLE 4*Test of Hypothesis Two: d/sIAT Scores Predict Suicide Attempts*

HLR step and variable(s)	<i>b</i> (SE)	OR (95% CI)	R_L^2	Incremental R_L^2	Likelihood ratio test	<i>p</i> Value
Step 1						
Age	−0.03 (0.02)	0.97 (0.94, 0.99)	0.028	0.028	4.09	0.04
Step 2			0.178	0.150	22.05	<0.0001
Patient prediction	0.46 (0.17)	1.58 (1.13, 2.19)				
Clinician prediction	0.35 (0.12)	1.42 (1.13, 1.79)				
Step 3			0.224	0.046	6.66	0.01
IAT D score	1.59 (0.64)	1.89 (1.15, 3.12) ^a				

Odds ratio (OR) based on a 0.40 unit increase in d/sIAT score (about 1 standard deviation).

finding that individuals hospitalized due to risk of suicide experienced a significant decrease in suicide ideation within 24 hours of admission (Russ et al., 1999). Moreover, patients who attempted suicide prior to admission were more likely to report being free of suicide ideation than participants who had not attempted just prior to admission. However, it is important to note that these findings are limited by reliance on participants' self-report and that the CMSB needs more prospective empirical evaluation.

Future research should examine the impact of acute affect on d/sIAT scores among participants with and without elevated suicide risk. Additionally, researchers should continue to assess the psychometric properties of the d/sIAT in samples with greater variability in suicide risk. Evaluation of test–retest reliability and identification of variables that confound task performance will assist in determining appropriate uses of the measure. Researchers should also evaluate the d/sIAT's capacity to serve as a marker of short-term suicide risk (i.e., to predict attempts within hours or days rather than months). If research demonstrates the reliability and validity of the d/sIAT, then investigators should evaluate the impact its use has on clinical decision making.

Limitations

Results may not generalize to non-veteran samples or individuals at lower risk

of suicide. Participants' acute affect was not assessed so it is unknown how this may have influenced their responding. Some suicide attempts may have gone undetected. The follow-up was based on self-report and medical record review, which is also largely composed of self-report. Informed consent and discussion that confidentiality would only be broken if participants were at imminent risk of suicide should have increased participants' willingness to disclose attempts. Additionally, VA providers' utilization of standardized documentation of suicidal behavior likely enhanced the quality of the information gathered in the medical record review.

CONCLUSION

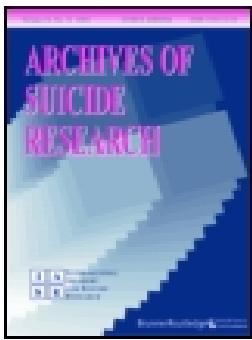
The d/sIAT has now demonstrated incremental predictive validity for suicide attempts during a 6-month period in two separate research studies, each targeting a unique patient population. Findings from the current study show that self-associations with life and death assessed by the d/sIAT may still serve as a behavioral marker of suicide risk, even when the task is used outside of an emergency room. Overall, the d/sIAT may be a promising measure for augmenting suicide risk, assessment in the future and gaining a better understanding of suicidal crises, but more work needs to be done to understand its psychometric properties and to determine how it can be used clinically to inform treatment decisions.

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Ecological Momentary Assessment is a Neglected Methodology in Suicidology

Collin L. Davidson, Michael D. Anestis, and Peter M. Gutierrez

Ecological momentary assessment (EMA) is a group of research methods that collect data frequently, in many contexts, and in real-world settings. EMA has been fairly neglected in suicidology. The current article provides an overview of EMA for suicidologists including definitions, data collection considerations, and different sampling strategies. Next, the benefits of EMA in suicidology (i.e., reduced recall bias, accurate tracking of fluctuating variables, testing assumptions of theories, use in interventions), participant safety considerations, and examples of published research that investigate self-directed violence variables using EMA are discussed. The article concludes with a summary and suggested directions for EMA research in suicidology with the particular aim to spur the increased use of this methodology among suicidologists.

Keywords suicide, Ecological Momentary Assessment, Experience Sampling Method

Many research studies in suicidology rely upon retrospective self-report measures of self-directed violence variables and related constructs (e.g., hopelessness, depressive symptoms, sleep disturbance). An alternative method that has been fairly widely adopted in other areas of psychological and psychiatric research is ecological momentary assessment (EMA) which has also been referred to as the Experience Sampling Method (ESM; Csikszentmihalyi & Larson, 1987). In the current article, we will use EMA as this term refers to a broader array of methodology than ESM (see Shiffman, Stone, & Hufford, 2008). EMA refers to a broad category of methods that aim to measure variables of interest more frequently and flexibly across time and within a more natural setting. For instance, a researcher interested in factors that lead to nicotine cravings in recently

abstinent smokers could assess cravings multiple times per day and ask the participants to indicate cravings at each assessment. Further, this design is likely more sensitive to contextual variables that impact cravings such as location, time of day, variation throughout the day, and other related variables of interest (e.g., negative affect; Shiffman, 2005). Researchers have compared the use of traditional self-report methods to a snapshot whereas EMA can approximate a movie of constructs of interest (Schiffman, Stone, & Hufford, 2008).

The current article aims to provide a brief overview of some design issues in EMA research with a particular emphasis on the relevance for the field of suicidology. An introduction to this methodology is particularly important for suicidologists given the relative lack of EMA studies in the suicide literature, the unique

contributions this methodology could make to theoretical conceptions of suicide risk, and the potential implications for assessment and intervention for suicide risk. More comprehensive treatment of EMA design issues and considerations are available in excellent articles (e.g., Palmier-Claus, Myin-Germeys, Barkus et al., 2011; Shiffman, Stone, & Hufford Smith, 2008) and book length treatments (e.g., Hektner, Schmidt, & Csikszentmihalyi, 2007; Stone, Shiffman, Atienza et al., 2007).

How to Collect the EMA Data: Paper Diaries, PDAs, and Cellular Phones

When designing a study that utilizes EMA, one of the most immediate considerations is the method used to collect the EMA data. In general, there are three broad options—paper diaries, personal digital assistants (PDAs), and cellular phones. Many early EMA studies utilized paper diaries generally bound in a portable binder and paired with a mechanism—such as a watch with an alarm—to alert participants when it was time to complete the next diary. This method is the most technologically straightforward but has serious flaws both generally and in suicide research. First, there is good evidence that participants using paper diaries tend to miss scheduled times to complete them and there is no easy way to verify when the diaries were completed. The phenomenon of not filling in responses in accordance with the study design and completing the diaries at a later time is referred to as hoarding and backfilling of responses.

A particularly creative study used a small device in the binder which provided a covert electronic timestamp each time the binder was opened. Results demonstrated that, though participants reported high rates of compliance with the sampling protocol, the electronic record reported that 79% of entries were backfilled (Stone,

Shiffman, Schwartz et al., 2003). Other general disadvantages to this method include difficulty employing branching logic based on responses to specific questions, the heavy burden associated with carrying a binder of diaries, and complications in securing the data in case of loss or theft. For studies interested in self-directed violence variables, paper diaries are also problematic from a safety monitoring perspective (discussed below). For instance, if a researcher was measuring suicidal ideation, there would be no automatic way to know if a participant scored particularly high, and thus would require clinical attention.

A method that is likely the most prominent in the literature is the use of PDAs to implement the EMA questions. PDAs are palm-sized computers that can be programmed with flexible assessment protocols, allowing for branching logic, time-stamping of responses, and real-time automated responses based upon participant responses. Thus, the primary disadvantages of paper diaries (hoarding and backfilling of responses) can be verified and reduced using PDAs. However, PDAs are rapidly becoming technological relics as smart phones become more accessible and advanced. Unfortunately, many manufacturers no longer make new PDAs and researchers are thus forced to purchase refurbished devices. Further, participants may be less likely to remember to carry an additional device than if they were to use their own (or a study-provided) cellular phone. A specific issue when applied to suicide research is that real-time access to participant responses is not possible on some devices and difficult on others. While researchers can instruct participants to upload the data daily via their personal computer and then check for concerning responses, this adds to the burden of participation. Additionally, participants may forget to complete this step and, even with perfect compliance, the concerning

response may not be seen by research staff for 12 or more hours. More recent PDAs allow for wireless internet access that would allow responses to be sent to researchers when a participant is connected to a wireless network. However, not all participants have access to wireless internet which could limit this option. Potential methods of addressing concerning responses on PDAs are discussed below.

A final mechanism for collecting EMA data is through cellular phones. Research suggests that 88% of Americans own a cellular phone and 46% own a smart phone (Smith, 2012). Cellular phones include all the advantages as PDAs as well as some unique advantages. The increasing access to cellular phones and the options that the technology provides is staggering. Researchers can collect data using text messages or with specifically designed apps which allows for the most flexibility of the three methods discussed. For suicidologists, real-time data monitoring is fairly easy and automated emails can be set up to alert research staff of concerning responses. Further, if participants use their own phone in a study, it does not require that they remember to carry an additional item to complete the assessments. This difference may increase compliance to the study protocol. Cellular phones also are most useful when considering participant safety as discussed below.

EMA Sampling Schemes

The sampling schemes for EMA can be divided into two broad methods: Event-based sampling and time-based sampling. Event-based sampling asks participants to complete a set of questions when they engage in a pre-defined behavior or experience (e.g., each time they experience suicidal ideation or engage in self-harm). This sampling method has the advantage of not missing important data, but depends

upon the participant to remember the pre-defined behavior or experience and to initiate a response. Researchers should consider that participants may not remember to initiate the response, for a number of reasons including emotional distress, intoxication, and forgetting.

Time-based sampling schemes generally alert participants to respond on a certain pre-set schedule or a randomized time-based schedule. When using this method, researchers must determine how frequently they would like to assess variables of interest; if they want a set, randomized, or stratified random sampling; and the time periods that would be most important to assess. Further, researchers can ask participants to respond based upon how they feel at the moment of the assessment or how they have felt in the time since the last assessment.

For self-directed violence behaviors, assessment time period is a very important consideration especially since these variables may be sufficiently rare that they may not be detected by reports constrained to the moment of assessment. Sampling of the time period since the last assessment, however, provides a broader window during which events like suicidal ideation or self-harm could occur. Finally, it is important to note that event-based and time-based methods can be combined to gather a more comprehensive collection of variables of interest. Participant burden should be considered when determining the frequency of assessments, number of questions per assessment, and time periods during which assessments occur (e.g., early morning, late night). Similar to considerations for general research design, several EMA experts suggest that EMA method determinations are made based upon the research questions of the study, knowledge of the variables of interest, analysis plan, and the population being studied as opposed to applying rigid rules-of-thumb (e.g., Palmier-Claus et al., 2011; Shiffman 2007).

Use of EMA in Psychiatric Populations

Although an in-depth review of studies utilizing EMA in psychiatric populations is beyond the scope of the current article, it is important to briefly mention the various populations that have successfully participated in EMA research. Participants with a broad spectrum of psychiatric disorders have engaged in EMA studies including those with mood disorders (Wenze & Miller, 2010), anxiety disorders (Karr et al., 2012), schizophrenia (Granholm, Loh, & Swendsen, 2008), borderline personality disorder (Jahng, Solhan, Tomko et al., 2011) and substance use disorders (Marhe, Waters, van de Wetering et al., 2013). Together, these studies argue for the feasibility of EMA methodology among people with psychiatric disorders.

Utilization of EMA in Studies Examining Suicidal Ideation and Non-Suicidal Self-Injury

As mentioned earlier, there is a surprising lack of studies using EMA to examine self-directed violence variables. A literature review revealed eight publications in this area which stemmed from five unique studies (see Table 1 for a summary of the studies). These studies provide important examples for how this methodology can be harnessed in suicidology.

The first study (Links, Eynan, Heisel et al., 2007) employed PDAs programmed to collect 6 time-contingent assessments per day for 3 weeks. The EMA assessments included 27 mood states and past suicidal ideation was assessed with the Scale for Suicidal Ideation (SSI; Beck, Kovacs, & Weissman, 1979) and behavior was assessed using the Suicide Behaviors Questionnaire (SBQ; Linehan, 1996). Results indicated that negative mood intensity significantly related to suicidal ideation and

behavior after accounting for depression and global stress. In contrast, other aspects of affective instability measured in the study—mood amplitude, dyscontrol, and reactivity—were not associated with suicidal ideation or behavior. Using the same sample as Links, Eynan, Heisel et al. (2007), Links, Eynan, Heisel et al. (2008) investigated the association between affective instability and past suicidal behavior in adults with Borderline Personality Disorder. For the purposes of analyses, participants were separated into 4 groups on the basis of low and high scores on negative mood intensity and amplitude (magnitude of affect change). Results indicated that those with high negative mood intensity and high amplitude had significantly higher SBQ scores than the other 3 groups. A final study also used the data from the Links, Eynan, Heisel et al. (2007) study to investigate negative mood variability in people with Borderline Personality Disorder (Nisenbaum, Links, Eynan et al., 2010). Results indicated that there was significant mood variability throughout the day and between participants. The mood variability was significantly impacted by suicidal ideation, hopelessness, and depression.

Another study used EMA to examine suicidal and non-suicidal self-injury thoughts and behaviors in adolescents (Nock, Prinstein, & Sterba, 2009). Participants were brought to the laboratory, trained to use a PDA, and assessed for a period of 2 weeks. The PDA alerted participants to respond to a set of questions at mid-day and the end of the day and participants were asked to initiate a response each time they experienced a self-directed violence thought or behavior. To monitor safety, participants were asked to upload their data each night via a personal computer and research staff checked the responses the next morning. Research staff contacted participants if responses suggested imminent risk of self-directed

TABLE 1. Studies Using EMA to Investigate Self-Directed Violence Behaviors

Authors	Population	EMA method	Frequency and type of assessment	EMA variables
Links et al. (2007, 2008) and Nisenbaum et al. (2010)	82 Adults with Borderline Personality Disorder	PDAs and paper diaries	6 time contingent assessments per day	26 mood states Details of current situation
Nock et al. (2009)	30 Adolescents who experienced thoughts of self-harm during the previous week	PDAs	2 time contingent assessments per day and event-contingent assessment when participants experience self-directed violence thoughts or behaviors	NSSI Suicide Attempt Substance/Alcohol use Binging Purging Impulsive Spending Unsafe Sex Function, Consequence, and Duration of NSSI
Muehlenkamp et al. (2009) and Anestis et al. (2011)	131 Adult females diagnosed with Bulimia Nervosa	PDAs	7 time contingent assessments per day, event contingent assessment when participants experienced NSSI or other dysregulated behaviors	Mood Stress Bulimia Nervosa Behaviors (including NSSI)
Palmier-Claus et al. (2012)	27 individuals at ultra high risk to develop psychosis	Paper diaries and a wristwatch	10 time contingent assessments per day	Positive Affect Negative Affect
Humber et al, (2013)	21 incarcerated adult males	Paper diaries with entries triggered by daily events	9 time contingent assessments signaled by daily events	Anger Psychological Distress Self-harm ideation Suicidal Ideation

violence or if they did not upload responses for 3 consecutive days. The study was able to report on an impressive array of results. First, participants experienced one thought of NSSI per day and two episodes of NSSI per week. On average, participants experienced suicidal ideation once per week and there were no

suicide attempts. Episodes of NSSI were preceded by NSSI thoughts that were more intense and shorter in duration and by feelings of rejection, numbness, self-hatred, and anger. NSSI behavior tended to serve an intrapersonal reinforcement function more than interpersonal reinforcement, and served to regulate affect and cognition.

Muehlenkamp and colleagues (2009) examined positive and negative affect before and after NSSI in a sample of women with Bulimia Nervosa. The study used PDAs and a mix of time-contingent and event-contingent sampling to assess the occurrence of NSSI, mood, and stress (see Table 1 for more details). Participants completed assessments for a period of 2 weeks. In this study, the authors monitored a selection of critical items and, when participants endorsed those items, members of the research team contacted the participants and discussed their answers to ensure safety. Results indicated that positive affect tended to be lower and negative affect higher prior to NSSI and that positive affect increased following the NSSI episode. Another publication used the same sample as the Muehlenkamp, Engel, Wadeson et al. (2009) study and examined predictors of NSSI among adult females with bulimia nervosa (Anestis, Silva, Lavender et al., 2011). Results indicated high trait affective lability and history of suicide attempts interacted to predict NSSI.

A further publication used EMA to investigate the relationship between positive and negative affective instability and suicidal thoughts in 27 individuals at “ultra-high risk” to develop psychosis—operationalized as those experiencing sub-clinical psychotic symptoms, a brief psychotic episode, or a family history of psychosis combined with a decrease in overall functioning (Palmier-Claus, Taylor, Gooding et al., 2012, p. 75). Participants were given paper diaries and a wristwatch programmed with multiple alarms to assess positive and negative affect 10 times per day for 6 days. Suicidal thoughts and behaviors were assessed at the conclusion of the study using the Comprehensive Assessment of At-Risk Mental State (CAARMS; Yung, Yuen, McGorry et al., 2005) semi-structured interview. Since suicidal ideation was not assessed with

EMA, specific participant safety procedures were not required during the EMA data collection period. The lead author contacted participants mid-week to answer questions, encourage participation, and offer advice. Results indicated that variability of positive and negative affect predicted the frequency of suicidal ideation and negative affect variability predicted the severity of suicidal ideation. Mean scores of positive and negative affect were not significant predictors. The finding that affect variability was a significant predictor of suicidal ideation whereas the mean scores were not underscores one of the ways that EMA can be used to test a research question in a more sophisticated and reliable manner than retrospective self-report (e.g., actual measure of mood variability versus retrospective recall of variability).

A final study investigated the association between anger and self-harm ideation and suicidal ideation in 21 incarcerated male inmates (Humber, Emsley, Pratt et al., 2013). Participants filled out paper diaries for 6 days. Entries were roughly time contingent, relying upon 9 events all inmates experienced throughout the day to trigger responses since electronic signaling was not allowed in the facility. Analyses controlled for depression, hopelessness, and impulsivity. Results of cross-sectional analyses revealed that anger was related to self-harm ideation and psychological distress but not with suicidal ideation. Longitudinal analyses indicated that anger and self-harm ideation were not significantly associated but anger did positively predict wanting to live.

Benefits of EMA in Suicidology

Having discussed the technical aspects of EMA, it is also important to consider the potential benefits of EMA when studying self-directed violence variables.

First, due to more frequent assessment, responses are less likely to be biased by retrospective report. Since the time frame is much shorter, participants are more likely to accurately report their suicidal ideation or self-harm accurately. EMA also allows for a much more nuanced view of variables over time as emotional states, thoughts, and behaviors often wax and wane over the course of a day (Eaton & Funder, 2001). This seems particularly pertinent to a variable like suicidal ideation, which may be present only fleetingly on a daily basis. EMA thus has the potential to more accurately track this variation (and account for potential variables impacting this variation) relative to traditional self-report.

Testing certain assumptions of theories of suicidal behavior may be more easily accomplished using the EMA approach than standard retrospective self-report. For instance, Fluid Vulnerability Theory holds that each individual has a set-point of baseline risk for suicidal ideation. Individuals with chronic suicide risk are posited to react more strongly to objectively less stressful events and to maintain the elevated state of suicide risk for a longer period of time (Rudd, 2006). EMA could be used to test these assertions more accurately by assessing variables of interest several times throughout the day. Tenants of another prominent theory of suicide, the interpersonal psychological theory (Joiner, 2005), also could be tested with EMA. While research has generally supported the hypothesis that perceived burdensomeness (PB) and thwarted belongingness (TB) are associated with suicidal ideation, researchers know much less about the contexts which increase these variables in people. Further, it is unclear the degree to which these interpersonal risk factors are malleable and the circumstances in which they may change.

It is likely that other notable suicide risk factors fluctuate throughout a day or week. For instance, hopelessness is a

construct that has been shown to be predictive of suicidal ideation, attempts, and deaths but is usually assessed at a single time point. It could be that the level of hopelessness varies as a function of stressful events throughout the day, level of behavioral activation, or the presence of various social contacts. Another suicide risk factor that lends itself to EMA is alcohol use. Research has generally demonstrated that alcohol use is related to increased suicidal ideation (e.g., Connor, Gunzler, Tang et al., 2011). However, it is unclear if alcohol use leads to suicidal ideation, suicidal ideation leads to alcohol use, or some combination of these possibilities. Such a research question is more readily addressed with EMA than with other methods. Obtaining multiple measures of important constructs could lead to a more accurate assessment of these variables and could even suggest novel interventions as more intricate and temporal relationships are revealed.

Although largely preliminary in nature, a developing literature has indicated that psychiatric interventions utilizing mobile technology are acceptable to patients and offer potential utility in mitigating mental health concerns (e.g., Whittaker, Merry, Stasiak et al., 2012). In a study examining the utility of a mobile phone-based psychotherapy in the treatment of individuals hospitalized due to a suicide attempt, Marasinghe, Edirippulige, Kavanagh et al. (2012) reported success in reducing suicidal ideation and depression (but not self-directed violence) relative to usual care. Should future research in larger samples with more stringent experimental designs demonstrate effectiveness—both in terms of long-term symptom reduction and cost-effectiveness—such interventions could potentially be utilized in conjunction with EMA assessments, thereby providing externally valid real time data with clear clinical utility.

Researchers could also consider using EMA in suicide intervention studies by

sending reminder messages (e.g., to look at a Suicide Safety Plan each morning, to contact a mental health provider) or simply considering the monitoring as an early phase of intervention. The literature on behavior change generally indicates that self-monitoring of a behavior (e.g., eating, smoking, anxiety) can decrease the frequency of this behavior (Hiebert & Fox, 1981; Maas, Hietbrink, Rinck et al., 2013; Mcfall & Hammen, 1971). Further, research has suggested that assessing suicide risk can serve to decrease suicidal ideation and negative affect in acutely suicidal individuals (Gould, Marrocco, Kleinman et al., 2005; Smith, Poindexter, & Cukrowicz, 2010). Even if an experience such as suicidal ideation did not decrease through monitoring, participants might feel less hopeless if they see that their suicidal ideation varies over time. The majority of cognitive-behavioral therapies include monitoring of behaviors or symptoms of interest for this very reason (Barlow, 2008). Finally, contextual variables that are not often considered in suicide research such as location, activity, and time of day can be considered as important contributors to suicidal ideation and behavior.

Participant Safety Considerations

While this method presents unique advantages for suicide researchers, it is not without its unique safety considerations. As the current article has already suggested, researchers have the potential to be aware of high risk responses on an ongoing basis. Any research study in suicidology that uses EMA should carefully consider how participant safety will be monitored and managed. EMA research studies generally include a brief training in the use of the collection device and how to accurately record responses prior to the study period. Suicide researchers should explicitly discuss with participants,

during the consent process, the assessment of self-directed violence-related variables and how concerning responses will be handled in the study to decrease confusion and increase the safety of participants. This training will likely differ by the data collection device.

For paper diaries, researchers could consider putting the number of the National Crisis Line, research staff, and other resources (e.g., participants' mental health clinicians) at the bottom of each page of the diary to promote help-seeking in the event of high levels of suicidal ideation or self-directed violence behavior. PDAs could be programmed to display this same information at the end of each assessment and/or if a participant exceeds a pre-defined cut-point on a given question. Cellular phones provide the most flexible monitoring and management of high-risk responses. Automated responses could be included, as mentioned with PDAs, and real-time monitoring of data is fairly simple. One particularly useful method is having the technology company who designs the EMA sampling to set up an automatic email to research staff when a participant exceeds a certain score on a self-directed violence question. Many companies also have portals for researchers where they can monitor responses in real time and the researchers could then reach out to an at-risk participant.

If the study is testing an intervention for self-directed violence, intervening for the safety of a participant may impact the outcome of the study, since higher risk participants may receive additional clinical attention. Therefore, researchers considering the use of EMA in an intervention study should carefully consider how the safety of participants will be balanced with the objectives of the study. Importantly, research has demonstrated that asking a participant about suicidal ideation and attempts does not increase suicide risk (Gould, Marracco, Kleinman et al., 2005).

While we know of no studies that investigated this question with EMA, it seems unlikely that EMA would have a different impact than more traditional assessment methods.

CONCLUSIONS

The benefits of using EMA have been more readily realized in other areas of health and psychiatric research than in suicidology. Suicidologists should familiarize themselves with EMA and design studies to test questions that EMA can address more easily than traditional retrospective self-report methods. We believe that participant risk during the EMA collection period can be effectively managed when investigating self-directed violence variables and that the benefits of this methodology outweigh the costs. For example, variables that fluctuate considerably across time (e.g., suicidal ideation, suicidal intent, hopelessness) could be more accurately characterized with EMA methodology than retrospective self-report. Further, EMA could be used to attain more accurate screening for risk of self-directed violence and improved risk assessment. Determining suicide risk at a single time point is likely to be dependent on a given individual's mood and events throughout that day whereas EMA would provide more data on which to make a determination of risk. Further, EMA presents an opportunity to create and implement novel and highly accessible interventions for those at-risk for self-directed violence. As technology improves, EMA will likely become more accessible and easily used in clinical settings. Clinicians utilizing EMA to track clients' behavior, mood, thoughts, and other relevant variables could gain a more complete picture of a given client's overall level of functioning. Such information could lead to interventions better tailored to effectively reduce suicide risk.

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Introduction to the Special Section: The Costs and Benefits of Working With Pooled Data

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Introduction to the Special Section: The Costs and Benefits of Working With Pooled Data

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Five articles appear in a special section of this issue of the journal reporting analyses of data pooled from clinical trials funded by the Department of Defense on interventions for active-duty service members and veterans at risk of suicide. An overview of the studies contributing data and participant characteristics is provided. The rationale for pooling data along with the costs and benefits of such efforts is discussed. It is concluded that utilizing pooled data, in keeping with efforts being conducted by other large funders of clinical trials, is challenging but that the benefits outweigh the costs. The articles in the special section are useful for clinicians, researchers, and policymakers.

Keywords: Suicide, attempted suicide, suicidal ideation, evidence-based practice, service member, veterans

It is well established that in the past five years suicide rates among active-duty service members surpassed those of age- and gender-matched civilians (Department of Defense, 2013; Kessler et al., 2014; LeardMann et al., 2013; Nock et al., 2013). It is also well established that veterans, both of the current conflicts as well as of previous generations, are at elevated risk of suicide relative to those who have never served (Knox, 2008). As a result, both the Departments of Defense (DoD) and Veterans Affairs (VA) are devoting significant resources to studying the problem of suicide and finding solutions. As a suicide-prevention researcher, the amount of funding now available from the DoD in research grants is truly inspiring. In fact, the DoD is now the largest funder of suicide-specific clinical trials in the United States. According to data compiled by the National Action Alliance for Suicide Prevention (2014), more than \$70 million has been allocated to suicide-focused intervention trials through approximately 30 individual awards. This level of funding for suicide research, let alone clinical trials, is significantly more than has been available in the United States for at least the past 20 years.

While these funded studies are testing a range of interventions in a variety of clinical settings, and many are currently in progress, most are well beyond their baseline assessment

points. The suicide research community is relatively small, and close-knit, which is even more true of those of us studying suicide in the military and in veterans. As a result, we are able to relatively easily keep on top of what our colleagues are doing and for the most part are aware of who has major grants. In early 2014 the idea was raised of pooling data from multiple clinical trials being funded by the DoD to try and answer research questions that would otherwise require designing new studies and would take years to conduct. The authors of the articles in this special section have taken advantage of the similarity in suicide-specific data being collected across DoD-funded clinical trials to create a pooled data set. After data sharing agreements were put in place with the principal investigators of the contributing studies and data combined, the authors began the process of testing hypotheses specific to each team's interests.

Baseline data were pooled from six clinical trials, three involved only active-duty military personnel, one recruited both military and veterans, and two focused solely on veterans. Four of the studies were single-site and the remaining two were multi-site. The larger of the two multi-site trials included participants at military installations in the United States and Europe. Many of these installations are joint bases where military treatment facilities serve members of multiple branches. It is beyond the scope of this introduction to go into great detail regarding the methods of the contributing studies. But brief details of each provide some context for understanding the nature of the data that were provided. The Jobs study is a randomized controlled trial

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TABLE 1
Demographic and Military Variables Across Study Sites

Variable	Contoia					Luxton					Gutierrez		Johnson		Bryan Army	
	Jobs Army (N = 154)	Army (N = 143)	Marines (N = 23)	Marines (N = 25)	Army (N = 185)	VA (N = 317)	Navy (N = 184)	Army (N = 107)	VA (N = 153)	Army (N = 130)	VA (N = 261)	VA (N = 140)	VA (N = 140)	VA (N = 140)	VA (N = 140)	VA (N = 54)
Age – <i>M (SD)</i>	26.8 (5.9)	27.1 (6.2)	22.4 (5.4)	24.0 (4.7)	24.0 (4.4)	43.7 (12.5)	23.7 (6.0)	26.3 (7.0)	45.7 (13.4)	27.0 (7.1)	54.5 (10.3)	47.9 (11.6)	47.9 (11.6)	47.9 (11.6)	47.9 (11.6)	25.5 (4.9)
Female (%)	18.0	21.0	21.7	12.0	36.8	10.1	31.0	33.6	10.5	29.2	13	12	12	12	12	16.7
Ethnicity																
% African American	22.1	10.0	4.3	4.2	9.2	8.9	14.2	8.4	23.5	16.3	35.2	20.9	20.9	20.9	20.9	9.8
% Hispanic/Latino/a	8.4	15.7	4.3	0	14.7	17.1	25.7	18.7	6.6	20.2	10.7	2.2	2.2	2.2	2.2	7.8
% AI/AN	0	2.1	0	0	0	1.9	0.5	0	1.5	2.3	1.5	1.4	1.4	1.4	1.4	3.9
% Asian/Pacific Islander	2.6	1.4	0	20.8	4.3	8.2	4.9	9.3	0	1.6	1.1	3.6	3.6	3.6	3.6	0
% Mixed or other	10.4	10.0	30.4	29.2	5.4	5.7	7.7	11.2	9.6	7.0	2.7	0	0	0	0	2.0
% Caucasian	56.5	60.7	60.9	45.8	66.3	58.2	47.0	52.3	58.8	52.7	48.7	71.9	71.9	71.9	71.9	76.5
Education																
% some HS; no GED	0.6	4.3	4.3	0	0.5	2.2	0	0	0.7	0	8	2.9	2.9	2.9	2.9	—
% GED	8.2	0.7	0	0	41.1	23.7	46.4	35.8	29.0	33.1	29.9	13.7	13.7	13.7	13.7	—
% High school diploma	32.7	36.2	73.9	70.8	52.4	57.9	49.7	50.9	51.7	54.6	42.1	1.4	1.4	1.4	1.4	—
% Business or tech train	3.1	1.4	21.7	8.3	52.4	57.9	49.7	50.9	51.7	54.6	42.1	1.4	1.4	1.4	1.4	—
% Some college/AA or tech degree	47.8	46.8	0	16.7	5.9	16.1	3.8	13.2	18.6	12.3	19.9	46	46	46	46	—
% BA or graduate degree	7.5	10.6	0	4.2	5.9	16.1	3.8	13.2	18.6	12.3	19.9	14.3	14.3	14.3	14.3	—
Current marital status																
% Never married	27.2	32.4	69.6	56.0	44.8	29.0	62.4	46.2	31.6	36.2	26.1	25.2	25.2	25.2	25.2	33.3
% Married	49.4	45.3	13.0	32.0	45.9	23.3	24.9	41.5	21.3	47.7	23.0	26.6	26.6	26.6	26.6	44.4
% Separated or divorced	22.8	22.3	17.4	12.0	9.3	44.2	12.7	12.3	42.6	16.2	47.1	46.0	46.0	46.0	46.0	18.5
% Widowed	0.6	0	0	0	0	3.5	0	0	4.4	0	3.9	2.2	2.2	2.2	2.2	3.7
Has children (%)	60.3	46.6	22.2	25.0	25.4	60.9	21.7	31.8	69.1	39.2	—	—	—	—	—	37.0
Military status																
% Active duty	100	100	100	100	98.9	0.9	98.4	94.4	0	96.2	0	0	0	0	0	100
% Veteran	0	0	0	0	0	95.3	0.5	1.9	98.0	1.5	100	100	100	100	100	0
% Other (Reserve, Guard, dependent)	0	0	0	0	1.1	3.8	1.1	3.7	2.0	2.3	0	0	0	0	0	0
Branch																
% Army	100	100	0	0	64.7	48.3	1.6	57.9	55.6	71.5	55.6	64.7	64.7	64.7	64.7	100
% Marine Corps	0	0	100	100	0.5	17.7	48.9	14.0	15.7	0.8	12.1	11.5	11.5	11.5	11.5	0
% Navy	0	0	0	0	28.8	18.6	49.6	25.2	19.6	3.8	18.8	16.5	16.5	16.5	16.5	0
% Air Force	0	0	0	0	3.8	14.8	0	1.9	7.2	23.8	11.7	10.1	10.1	10.1	10.1	0
% Other	0	0	0	0	2.2	0.6	0	0.9	2.0	0	.8	0	0	0	0	0
Enlistment year – <i>M (SD)</i>	2008 (4.7)	2007 (5.6)	2010 (5.3)	2009 (4.9)	2009 (2.8)	1990 (13.0)	2009 (4.5)	2008 (4.7)	1986 (13.8)	2007 (5.5)	1978 (11.4)	1985 (13.0)	1985 (13.0)	1985 (13.0)	1985 (13.0)	—
Years of service – Median (IQR)	4 (2–7)	4 (3–8)	2 (1–3)	3 (1.5–5.5)	3 (2–5)	4 (3–6)	3 (1–5)	4 (2–7)	4 (3–7)	4 (2–9)	4 (2–6)	—	—	—	—	4.9 (3.9)
1st four years of enlistment (%)	56.0	50.3	78.3	72.0	72.5	0	73.9	59.2	N/A	56.7	N/A	N/A	N/A	N/A	N/A	55.6
Rank																
% Junior enlisted	69.6	56.6	69.6	60.0	68.9	59.9	63.7	55.7	59.6	64.6	61.0	—	—	—	—	87.0
% NCO	20.5	19.6	21.7	32.0	25.7	32.8	32.4	30.2	34.4	22.3	34.3	—	—	—	—	13.0
% Senior enlisted	6.8	20.3	8.7	8.0	3.8	6.0	2.8	7.5	2.6	6.9	1.9	—	—	—	—	0

% Officer	3.1	3.5	0	0	1.6	1.3	1.1	6.6	3.3	6.2	2.7	—	0
Any combat deployment (%)	59.0	57.3	34.8	36.0	45.1	43.8	27.9	42.5	48.0	51.9	28.7	41.0	64.8
Number of combat deployments <i>M</i> (<i>SD</i>)	1.2 (1.2)	1.3 (1.6)	0.6 (0.9)	0.8 (1.8)	0.7 (0.9)	0.7 (1.1)	0.3 (0.6)	0.7 (1.1)	0.7 (1.0)	0.7 (1.0)	0.4 (.8)	—	1.1 (1.0)
Median (IQR)	1 (0–2)	1 (0–2)	0 (0–1)	0 (0–1)	0 (0–1)	0 (0–1)	0 (0–1)	0 (0–1)	0 (0–1)	1 (0–2)	0 (0–1)	—	1 (0–2)
Combat site													
% OEF/OIF/OND ever	59.0	55.9	26.1	29.2	40.3	32.8	17.1	36.8	25.0	50.4	—	—	64.8
% Other conflict only	0	1.4	8.7	4.2	0	5.0	0	0	13.0	0.8	—	—	—
Era of active-duty service	100	100	100	100	100	51.3	100	100	39.6	100	12.3	29.5	100
% OEF/OIF/OND													

Note. AA = associate of arts degree; AI/AN = Alaskan Indian/Alaskan Native; BA = bachelor of arts degree; GED = general equivalency diploma; HS = high school; IQR = interquartile range; NCO = noncommissioned officer.

TABLE 2
Research Study Design, Sample, and Inclusion/Exclusion Criteria

Recruitment settings	Jobs (<i>N</i> = 154)	Comtois (<i>N</i> = 192)	Luxton (<i>N</i> = 1,188)	Gutierrez (<i>N</i> = 261)	Johnson (<i>N</i> = 140)	Bryan (<i>N</i> = 54)
	Army base	Army base; Marine installations	U.S. and European military installations; VA Medical Centers	VA Medical Center	VA Medical Center	Army base
Interventions offered in clinical trial (all data collected prior to randomization)						
Experimental intervention(s)	TAU organized by CAMS	TAU + Caring Contacts via Text	TAU + Caring Contacts via E-mail	Receive prescription medications in blister packaging	Postdischarge process groups organized by Suicide Status Form	Crisis Response Plan vs. Enhanced Crisis Response Plan with Reasons for Living TAU
Control intervention	TAU	TAU	TAU	Dispense as usual	Postdischarge process group	
Inclusion criteria						
Military status	Active duty	Active duty, Reserve; National Guard	Active duty; veteran; retiree; National Guard; Reserve	Veteran and not currently active duty in any branch	Veteran	Active duty
Age	18 and older	18 and older	18 and older	18 and older	18 and older	18 and older
Branch	Army	Army; Marine Corps	Any	Any	Any	Army
Suicidality	Suicidal ideation (SSI \geq 13)	Suicidal ideation (SSI \geq 1)	—	—	Any level of suicidality (ideation and/or behavior) that led to inpatient psychiatry admission	Current suicidal ideation with intent to die or lifetime suicide attempt
Approval by clinician	Yes	Yes	Yes	—	—	—
Has phone to receive texts or account to receive e-mail	—	Texts	E-mail	—	—	—
Diagnosed with major affective disorder, PTSD, and/or schizophrenia	—	—	—	Yes	—	—
	—	—	Current	—	Current	—

Current or recently discharged from inpatient psychiatric care	—	—	—	—	Yes	—	—	—
Currently prescribed medications they can manage outpatient	—	—	—	—	Yes	—	—	—
Speaks and understands English	Yes	Yes	Yes	—	Yes	Yes	Yes	Yes
Informed consent	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Exclusion criteria								
Type of condition severe enough to preclude consent or participation in treatment intervention	Psychosis, cognitive or physical impairment	Cognitive impairment (from brain damage, psychosis, etc.)	Adverse behavioral problems or incompetent to consent	Inability to comprehend consent form	Prominent problems with psychotic symptoms or significant cognitive impairments	Psychiatric or medical		
Judicially ordered/prisoner	Yes	Yes	Yes	Yes	—	—	—	—
Involuntary commitment	—	—	Yes	—	—	—	—	—
Other	—	—	Yes	Not enrolled in another study at medical center	—	—	—	—

Note. CAMS = Collaborative Assessment and Management of Suicide; PTSD = post-traumatic stress disorder; SSI = Scale for Suicidal Ideation; TAU = treatment as usual; VA = Veterans Affairs.

(RCT) of the Collaborative Assessment and Management of Suicide (CAMS; Jobes, 2006) being conducted in outpatient behavioral health. Comtois and colleagues are testing the effectiveness of text messaging as a way to help service members in treatment for suicide risk feel more connected and cared for. The Luxton study is testing a similar premise, but using e-mail contacts instead of text messages. Both studies are based on the work of Motto's caring letters studies (Motto, 1976; Motto & Bostrom, 2001). Gutierrez and colleagues tested the effectiveness of blister-packaging medication to increase treatment adherence and improve clinical outcomes in veterans at high risk of suicide due to psychiatric illness. The Johnson and colleagues study utilized a standardized suicide assessment tool to organize process group sessions for veterans recently discharged from an inpatient psychiatric unit and compared results of those groups to groups not organized by assessment data. Finally, Bryan's study is an RCT of a brief cognitive-behavioral intervention to increase soldiers' ability to remember and benefit from their stated reasons for living while undergoing treatment for suicide risk.

Table 1 identifies the principal investigators of the contributing trials and provides comprehensive demographic information about the participants. The total pooled sample represented 1,876 clinical trial participants from 13 U.S. military and Veterans Affairs facilities. As can be seen in Table 1, the pooled sample was quite diverse in terms of demographic and military-specific variables. Inclusion and exclusion criteria also varied by clinical trial and are summarized in Table 2. The articles in this special section provide results from analyses of different subsets of the pooled data, which are described in each.

Study principal investigators sent fully deidentified data sets to a single site for creation of a complete data set. Extensive work was done to ensure there was consistency in variable names and formats so that the separate data sets could be combined into a single, large data set for analyses. There was frequent communication with the research teams from each contributing study throughout the process. The final pooled data set was carefully checked and thoroughly cleaned before being made available to the author teams of the articles in this special section. Although the process was time consuming and required significant statistical expertise at the site where the data sets were merged, the resulting pooled data set is unique and quite valuable. The amount of time it took to assemble the pooled data set pales in comparison to the effort involved with collecting all new data to test the hypotheses and answer the study questions raised by the authors of the articles in this special section.

In addition, conducting these secondary analyses and publishing the results represents a significant leveraging of the original funding committed to the source studies, thus increasing the overall return on investment. This is particularly important because all of the grant funding came from the DoD and not private foundations. We are making the most of the taxpayers' investment in scientific research.

Our efforts to assemble data collected from multiple studies to take advantage of the power of pooled data is in keeping with work being done by the National Institutes of Health, Military Suicide Research Consortium, and others to leverage common data elements. The articles in this special section nicely highlight the benefits of this approach. Although there are also challenges in working with pooled data, on balance the benefits are large and well worth the work. The results of the analyses reported in these five articles should be useful for clinicians working with high suicide risk service members and veterans, other suicide prevention researchers, and DoD and VA policymakers.

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Physical Activity, Suicide Risk Factors, and Suicidal Ideation in a Veteran Sample

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The association between current level of suicidal ideation and physical activity was tested in a broad sample of veterans seeking care from the Veterans Health Administration. It was hypothesized that the two variables would be significantly inversely related. It was further hypothesized that the relationship would be mediated by depressive symptoms, disturbed sleep, and a measure of heart rate variability based on existing research regarding physical activity and sleep. Due to the first hypothesis not being supported, the second could not be tested. Post hoc correlation analyses did find associations between physical activity and depressive symptoms, in expected directions, and are discussed. Possible explanations for the negative findings along with recommendations for future research to continue exploring links between suicide risk and physical activity are presented. We conclude by suggesting that physical activity may have promise as a risk reduction intervention and that prospective data are more likely to yield significant results than the cross-sectional methodology employed in the current study.

Suicide is a well-recognized public health problem which takes the lives of approximately 41,000 Americans per year (Centers

for Disease Control and Prevention, 2013). In 2010, it was estimated that over 20% of suicides were veterans (Kemp & Bossarte, 2012). Psychosocial interventions for those at risk for suicide have demonstrated reductions in suicide risk, although these interventions frequently focus on individuals who are the highest risk for suicide, require specialized training, are time intensive, and are not always accessible to the population at large (Brown et al., 2005; Linehan et al., 2006; Pollock & Williams, 2004). To make an impact on overall suicide rates, a public health approach to suicide prevention has been proposed by several researchers,

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specifically the implementation of universal strategies aimed at both symptomatic and asymptomatic individuals within the general population (Knox, Conwell, & Caine, 2004; Yip, 2005).

One potential universal intervention that has been shown to reduce several significant risk factors for suicide, including symptoms of major depressive disorder, sleep disturbance, and post traumatic stress disorder (PTSD), and is widely available to both civilian and military populations, is physical activity (Conn, 2010; Jakupcak et al., 2009; LeardMann et al., 2011; Ribeiro et al., 2012). Physical activity is cost-effective, has relatively few side effects, and can be modified to an individual's capability, thus providing a level of adaptability not often available with other interventions. Additionally, this universal intervention does not carry with it the same stigma associated with mental health treatment, which has been cited by veterans of the Operation Enduring Freedom (OEF) and Operation Iraqi Freedom (OIF) conflicts as a significant barrier to seeking treatment for psychiatric disorders (Hoge et al., 2004). Veteran and military populations engage in significant amounts of physical activity as a part of their military training and thus may be more receptive to such an intervention for symptoms of psychiatric disorders, as well as suicide ideation. Research has demonstrated the effectiveness of physical activity on known risk factors for suicide. However, relatively few studies have examined the connection between physical activity and suicide, and even fewer have explored the links within veteran and military populations.

PHYSICAL ACTIVITY AND SUICIDE RISK FACTORS

Depression

Research has consistently demonstrated that physical activity is effective for treating subclinical depression (Conn, 2010)

and major depressive disorder (Lawlor & Hopker, 2001). In 2013, Cooney et al. (2013) conducted a meta-analysis of 39 randomized controlled trials, with a total of 2,326 participants, and found physical activity to be moderately more effective than no therapy for reducing symptoms of depression. Multivariate analyses indicated that people who had not participated in physical activity in the last month were at higher risk for a suicide attempt after controlling for depression, alcohol dependence, medical conditions, body mass index, and social support.

Disturbed Sleep

Several large-scale population-based studies have linked sleep problems to higher rates of suicidal ideation, attempts, and deaths (Goodwin & Marusic, 2008; Wojnar et al., 2009). Sleep disturbances have been linked to suicidal ideation (Ribeiro et al., 2012), self-harm (Wong, Brower, & Zucker, 2011), suicide attempts (Blasco-Fontecilla et al., 2011; Ribeiro et al., 2012), and deaths (Turvey et al., 2002). Two reviews (Driver & Taylor, 2000; Youngstedt, O'Connor, & Dishman, 1997) suggest that both short-term and long-term physical activity programs improve total sleep time, rapid eye movement (REM) latency, and delayed REM latency (with moderate effect sizes). More recent studies using experimental and longitudinal designs have found support for the favorable impact of physical activity on sleep disturbance (Buman, Hekler, Bliwise, & King, 2011; Reid et al., 2010).

Heart Rate Variability

Heart rate variability (HRV)—defined as the variability in timing between heart beats—has been posited as an index of a flexible autonomic nervous system that is capable of adapting to changing circumstances (Thayer, Hansen, Saus-Rose, & Johnsen, 2009). A specific frequency of HRV, respiratory sinus arrhythmia (RSA), has been posited to underlie social behavior

and emotional functioning (Porges, 2001). *RSA* is defined as the changes in heart beat that occur at the same frequency of breathing and is influenced by the vagus nerve. The autonomic nervous system of people with low *RSA* may have difficulty “putting on the brakes,” leading to increased emotional arousal commonly seen in affective disorders. Supporting this theory, low *RSA* has been associated with poorer reasoning, problem-solving, planning, and impulse control (Thayer & Brosschot, 2005; Thayer et al., 2009), and mental health conditions such as depression (Kemp, Quintana, Felmingham, Matthews, & Jelinek, 2012), generalized anxiety disorder (Thayer, Friedman, & Borkovec, 1996), and PTSD (Cohen, Matar, Kaplan, & Kotler, 1999), each of which are associated with risk of suicide. Involvement in regular physical activity has been shown to improve heart rate variability (Sandercock, Bromley, & Brodie, 2005), although the mechanism for this change is unclear. Thus, *RSA* may represent a biological mechanism of the potential relation between levels of physical activity and suicide risk.

Physical Activity and Suicide Risk

In one case-control study, people who were interviewed following a suicide attempt were five times less likely to have participated in physical activity in the prior month than matched controls (Simon, Powell, & Swann, 2004). In a randomized crossover trial of participants with a history of one or more suicide attempts and current hopelessness, those assigned to a mountain hiking intervention experienced lower levels of hopelessness, depression, and suicide ideation relative to those in the control condition. However, there seems to be a potentially iatrogenic effect of frequent vigorous activity on suicide risk (Brown & Blanton, 2002; Lee, Cho, & Yoo, 2013). Another study found that students who were physically active had significantly lower levels of depression, hopelessness, and suicidal behavior (a variable composed

of suicidal ideation and attempts; Taliaferro, Rienzo, Pigg, Miller, & Dodd, 2009).

To date, one study has attempted to address the relation between physical activity and suicide risk, finding that among veterans with severe PTSD, increased levels of physical activity were directly and indirectly (through decreased depression and improved sleep) linked to decreased suicide risk (Davidson, Babson, Bonn-Miller, Souter, & Vannoy, 2013). However, the results do not generalize to a broad population given the veteran sample, severity of mental health symptoms, and predominance of male participants.

LIMITATIONS OF PREVIOUS RESEARCH

While prior research has demonstrated the effects of physical activity on depressive symptoms, several gaps exist. Most research has utilized physical activity interventions to study the impact on depressive symptoms, but do not employ validated self-report measures of physical activity with participants. Therefore, it is difficult to accurately correlate amount and type of physical activity with psychological variables. Additionally, the research cited earlier primarily was focused on the connection between physical activity and psychological variables, but neglected to consider the interplay of physiological variables, such as *RSA*. Lastly, a significant gap exists in understanding potential mediators of the relation between physical activity and suicide ideation.

Hypotheses

In this study we tested the association between physical activity and suicidal ideation in a sample of veterans. It was hypothesized that there would be a significant negative association between amount of physical activity and level of suicidal ideation. It was further hypothesized that the relation between physical activity and sui-

dal ideation would be mediated by depressive symptoms, disturbed sleep, and RSA.

METHOD

Participants

Participants were 103 veterans recruited from VA health clinic programs: the Behavioral Health Laboratory (a service that conducts brief interventions with veterans presenting to the primary care clinic who evidence mental health symptoms), the MOVE program (a weight loss program), and mental health services. Six subjects were missing physical activity data, so 97 were retained for analyses. Participant demographic characteristics are summarized in Table 1; military-specific demographic characteristics are summarized in Table 2. The majority of participants (60%) were enlisted at time of separation from the military, served an average of 69 months ($SD = 56.8$), and 34% had never deployed. Their periods of service spanned from Vietnam (33%) to OEF/OIF (11%).

TABLE 1
Sample Demographics

Characteristic	Number of Responses	Mean (SD) or n (%)
Age	97	54.6 (11.3)
Male	97	85 (88%)
Race	96	
Caucasian		62 (65%)
African American		24 (25%)
Other		10 (10%)
Hispanic	96	16 (17%)
Education	93	
HS diploma or equivalent		24 (26%)
Some college, no degree		32 (34%)
Associate's degree		8 (9%)
Bachelor's degree		21 (23%)
Master's or doctorate		8 (8%)
Marital status	97	
Married		22 (23%)

TABLE 2
Military Demographic Variables

Characteristic	n (%)
Branch ($N = 60$)	
Army	19 (32%)
Air Force	15 (25%)
Navy	12 (20%)
Marines	6 (10%)
Multiple	8 (13%)
Number of combat experiences ($N = 61$)	
0	38 (62%)
1	16 (26%)
2	4 (7%)
3+	3 (5%)

Procedures

Individuals who did not speak English or had a cardiac pacemaker were not eligible to participate in the study. To be eligible for participation, participants had a history of suicidal ideation documented in their electronic medical record or endorsed suicidal ideation on the Suicide Behaviors Questionnaire-Revised (SBQ-R; Osman et al., 2001), were between the ages of 18–89, were actively engaged in care or eligible for care at the VA Medical Center (VAMC), and were able to come to the VAMC to complete the study. After consenting to participate in the study, participants completed a series of self-report measures and 5 minutes of resting heart rate recording, which occurred in a single visit. Participants were compensated \$25 for their time.

Measures

Suicidal Behaviors Questionnaire-Revised. The SBQ-R (Osman et al., 2001) is a four-item self-report measure that assesses a range of suicide-related variables. The SBQ-R has been shown to be a reliable and valid measure in nonclinical and clinical populations of adolescents and adults (Osman et al., 2001). The total score on the SBQ-R was used for screening purposes

such that individuals were included if they scored a 1 or higher on the measure.

Demographic Data. A demographics form asked participants to report age, gender, race/ethnicity, educational attainment, and a range of military-specific variables.

Adult Suicide Ideation Questionnaire (ASIQ; Reynolds, 1991). The ASIQ is a 25-item self-report measure that assesses suicidal ideation over the past month. Responses are answered on a 7-point scale ranging from *Almost every day* to *I never had this thought*. Total scores range from 0 to 150. A clinical cutoff score indicating further evaluation is necessary has been determined to be 31 and reliability and validity are good (Reynolds, 1991). In this study, internal consistency estimate was quite good ($\alpha = .96$).

Beck Depression Inventory II (BDI-II; Beck, Steer, & Brown, 1996). The BDI-II is a 21-item self-report scale which measures symptoms of depression. Responses range from 0 to 3 with qualitative descriptors that increase in severity specific to each question. Total scores are obtained by adding the score of each individual item. A total score of 0–13 is considered the minimal depressive symptoms range, 14–19 is mild, 20–28 is moderate, and 29–63 is severe. The BDI-II has good internal consistency and adequate validity (Beck et al., 1996), and in this study, internal consistency was high ($\alpha = .94$).

International Physical Activity Questionnaire (IPAQ; Craig et al., 2003). The IPAQ is a 27-item self-report measure of physical activity in the last 7 days which indexes days per week engaged in physical activity and time spent per day in physical activity. The questions are divided into the following domains: job-related physical activity; transportation physical activity; housework, house maintenance, and care for family; recreation, sport, and leisure-time physical activity; and time spent sitting. The IPAQ can yield both continuous (expressed in metabolic equivalent or MET minutes per week using specified formulas) and categorical (low, moderate, and high levels of activity) scores. The IPAQ has been validated for use in 12

countries, has good test-retest reliability, and has acceptable agreement with objective measures of physical activity (Craig et al., 2003).

Pittsburgh Sleep Quality Index (PSQI; Buysse, Reynolds, Monk, Berman, & Kupfer, 1989). The PSQI is a 19-item questionnaire that provides an index of global sleep quality and seven components of sleep quality. Questions are answered using a 4-point Likert-type scale (0 = *very good* to 3 = *very bad*) and (b) answer close-ended questions on a 4-point Likert-type scale (0 = *not during the past month* to 3 = *three or more times per week*). Scores are based on calculations across types of responses. The seven component scores (range = 0–3) and global score (range = 0–21), with higher number indicating more disturbance, have high levels of internal consistency and have demonstrated adequate test-retest reliability and discriminant validity (Buysse et al., 1989). For this study, internal consistency reliability estimate was calculated based on items 5a through 9 as 1–4 are not scaled and determined to be good ($\alpha = .81$).

Respiratory Sinus Arrhythmia. RSA was indexed from the electrocardiogram (ECG) signal that was collected using a three lead configuration and a Bio Amplifier provided by AdInstruments, model FE132 (AdInstruments, Colorado Springs, CO). The ECG was recorded with a sampling rate of 1000 Hz to ensure that the data are detailed enough to estimate RSA consistent with recommendations (Allen, Chambers, & Towers, 2007). To normalize the data, the variance was transformed using a natural log function (Allen et al., 2007).

Data Analysis Plan

All analyses assumed a two-sided test of hypothesis, a significance level .05, and were performed in SAS v9.2. To address the first hypothesis, a Pearson correlation coefficient with a 95% confidence interval was calculated for ASIQ and IPAQ scores. Due to the nonsignificant correlation between physical activity and suicidal ideation (see

Results), mediation analyses were not run. However, linear regression was used to explore the relationship between study variables and suicidal ideation.

RESULTS

The primary hypothesis, that participants' scores on the IPAQ would be significantly negatively associated with ASIQ scores, was not supported ($R^2 = .001$, $p = .74$). Participant scores on the self-report measures are summarized in Table 3.

Post hoc models were run to characterize the sample and help determine whether unique characteristics of these participants might explain the lack of an association between physical activity and suicidal ideation. As would be expected, scores on the BDI ($R^2 = .45$, $p < .01$) and PSQI ($R^2 = .07$, $p = .04$) were associated with suicidal ideation. There was no association between RSA and suicidal ideation ($R^2 = .004$, $p = .81$). Correlations were calculated between all study measures as well. Moderate negative correlations were found between BDI-II scores and both total activity ($r = -.23$, $p = .02$) and total walking ($r = -.29$, $p < .01$). Although not statistically significant correlations between ASIQ

scores, total activity and total walking were in the expected direction (i.e., negative).

DISCUSSION

Due to the lack of an association between level of physical activity and suicidal ideation, this study can best be characterized as a proof of concept. We have demonstrated that it is possible to collect valid and reliable data regarding sleep quality, heart rate variability, and suicide-specific variables in a sample of veterans receiving care at a VAMC. It does not appear that sample-specific characteristics are responsible for the nonsignificant correlation. Suicide risk was low, as assessed by total scores and critical items endorsed on the ASIQ. However, although the mean participant ASIQ score was below the clinical cutoff, it still indicated a fair amount of thoughts about suicide. Similarly, participants reported mild depressive symptoms on the BDI-II and some degree of sleep disturbance on the PSQI. Associations between the well-established suicide risk factors of depressive symptoms, sleep disturbance, and suicidal ideation further support that unique participant characteristics likely do not explain the nonsignificant finding.

The one variable that appears problematic is degree of physical activity. Mean level of physical activity, expressed in MET minutes per week, was 1,241 ($SD = 835$), which translates into over 20 hours per week. It seems unlikely that this is an accurate reflection of this group of veterans' typical activity level. However, we did find the expected significant association between walking and depressive symptoms as well as a nonsignificant association in the expected direction between walking and suicidal ideation. Given the strong support in the literature for the benefits of walking on overall health (Lee & Buchner, 2008) and mental health (Johansson, Hartig, & Staats, 2011), our data suggest that incorporating regular walking into veterans' treatment plans could

TABLE 3
Means and Standard Deviations

Measure	N	Mean (SD) or n (%)
PA (METs)	97	1,241 (835)
ASIQ Raw Score	97	20.4 (21.1)
0 ASIQ Critical Items Endorsed	97	88 (91%)
Log (HR Variability)	97	4.7 (1.9)
PSQI	92	10.1 (4.3)
BDI	97	19.2 (12.6)

Note. PA = Total activity score using the International Physical Activity Questionnaire; ASIQ = Adult Suicidal Ideation Questionnaire; HR = Heart rate; PSQI = Pittsburgh Sleep Quality Index; BDI = Beck Depression Inventory.

be beneficial. Further research with a larger sample and improved measure of physical activity is needed before concluding that walking may be a useful component of suicide prevention efforts. Had the IPAQ been administered as an interview so that instructions and unusual responses could be clarified the results might have been different.

The results of the current study also raise the question of whether physical activity and RSA measures are truly useful from a suicide assessment standpoint or whether the real benefit is in measuring change over time. Perhaps baseline physical activity is less important than the extent to which one increases their physical activity over time and experiences the well-documented positive effects on sleep, mood, and other known suicide risk factors. It would be interesting to test in future research if a group of patients with known suicide risk assessed by current levels of ideation, history of past suicide attempts, depressive symptoms, and hopelessness would experience decreases in these factors as a result of

an intervention designed specifically to increase their levels of physical activity.

While the current study failed to support its primary hypothesis, we have demonstrated that a relatively diverse sample of patients seeking care from a range of VA clinics do exhibit some indicators of potential suicide risk and are willing to endorse signs and symptoms on self-report measures. Assuming that a better measure of physical activity can be found, such as administering the IPAQ as an interview, it should be possible to study physical activity as a suicide risk reduction intervention in general patient populations. By also measuring RSA over time, it would be possible to determine whether this is one mechanism of action to explain the link between physical activity and psychological suicide risk. In turn, if increasing physical activity is supported as an efficacious intervention, a nonstigmatizing intervention to reduce suicide risk would be added to the clinician's toolkit. Walking appears to be a good candidate for the type of physical activity to increase.

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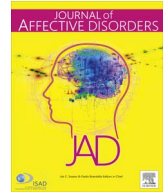
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Research paper

Exploring the association between exposure to suicide and suicide risk among military service members and veterans

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ABSTRACT

Background: Past research suggests that suicide has a profound impact on surviving family members and friends; yet, little is known about experiences with suicide bereavement among military populations. This study aimed to characterize experiences with suicide exposure and their associations with lifetime and current psychiatric symptoms among military service members and veterans.

Methods: A sample of 1753 United States military service members and veterans completed self-report questionnaires assessing experiences with suicide exposure, lifetime history of suicidal thoughts and behaviors, current suicidal symptoms, and perceived likelihood of making a future suicide attempt.

Results: The majority of participants (57.3%) reported knowing someone who had died by suicide, and of these individuals, most (53.1%) reported having lost a friend to suicide. Chi-square tests, one-way ANOVAs, and logistic regression analyses revealed that those who reported knowing a suicide decedent were more likely to report more severe current suicidal symptoms and a history of suicidal thoughts and behaviors compared to those who did not know a suicide decedent. Hierarchical linear regression analyses indicated that greater self-reported interpersonal closeness to a suicide decedent predicted greater self-reported likelihood of a future suicide attempt, even after controlling for current suicidal symptoms and prior suicidal thoughts and behaviors.

Limitations: This study utilized cross-sectional data, and information regarding degree of exposure to suicide was not collected.

Conclusions: Military personnel and veterans who have been bereaved by suicide may themselves be at elevated risk for suicidal thoughts and behaviors. Additional work is needed to delineate the relationship between these experiences.

1. Introduction

Suicide claims the lives of over 40,000 individuals in the United States (U.S.) each year (Centers for Disease Control and Prevention [CDC], 2015), and for each life lost to suicide, many other individuals are estimated to be impacted by the grief and pain associated with bereavement of the suicide decedent (Cerel et al., 2016; Shneidman, 1972). Military service members and veterans represent a group at especially high risk for suicide, with a number of studies revealing elevated rates of suicide deaths, attempts, and ideation in this population (Hoge and Castro, 2012; Kuehn, 2009; Nock et al., 2014; Ursano

et al., 2015). Consequently, it is likely that many current and former military personnel know or will know an individual who has died by suicide. Despite this assumption, there has been a notable dearth of research among individuals with a military service history who have been exposed to suicide, affected by suicide, and/or bereaved by suicide.¹

A growing body of research among non-military populations suggests that loss of a loved one to suicide can profoundly impact one's own mental health and suicide risk. For example, findings from a recent review of 57 studies on suicide bereavement experiences suggest that individuals who have lost a romantic partner to suicide are at

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¹ Throughout the manuscript, we will aim to utilize nomenclature proposed by Cerel et al. (2014) to capture the continuum of suicide survivorship. Specifically, the following three terms will be used: *exposed to suicide* (i.e., knowing someone who has died by suicide), *affected by suicide* (i.e., having experienced significant psychological distress following the suicide death of another individual with whom one may or may not have had a close relationship); and *bereaved by suicide* (i.e., short-term or long-term clinically significant distress following the suicide death of an individual with whom one had a close personal relationship). These categories are viewed as being nested (i.e., those *bereaved by suicide* have also been *affected by suicide* and *exposed to suicide*) rather than mutually exclusive.

increased suicide risk, parents bereaved by the suicide of a child are at elevated risk for involuntary psychiatric hospitalization, and children who have lost a parent to suicide may be at increased risk for developing depression (Pitman et al., 2014). Individuals who lose a parent to suicide during their childhood have also been shown to be at increased risk for death by suicide (Guldin et al., 2015). Importantly, a population-based study conducted by Omerov et al. (2013) found that the increased risk for depression observed among suicide-bereaved parents was not significantly accounted for by mental health problems that predated the suicide death (i.e., the suicide death itself appeared to confer depression risk). There is also evidence suggesting that grief reactions may be more severe among those who lose a loved one to suicide than those who lose a loved one to non-suicide causes of death (Barrett and Scott, 1990; de Groot et al., 2006; Jordan, 2001).

Regarding experiences with suicide survivorship among military populations specifically, to our knowledge, only one study to date has examined the impact of exposure to suicide in a military sample. In this study, Cerel et al. (2014) investigated the prevalence and correlates of exposure to suicide among military veterans in the U.S. state of Kentucky using a random digit dial survey study design. Of the 931 veterans who participated, nearly half (47.1%) reported exposure to suicide at some point during their lives. Consistent with aforementioned research, those with lifetime exposure to suicide were significantly more likely to report clinically significant depression and anxiety symptoms, as well as suicidal ideation, than those without exposure to suicide. Notably, these symptoms were elevated among those who reported greater perceived closeness to the suicide decedent. These findings provide preliminary evidence for the impact of suicide exposure and bereavement on future suicide risk among military veterans, but the authors note that the study's sampling strategy limits its generalizability (e.g., one southern U.S. state, relatively older veterans [$M_{age}=61.6$, $SD=15.42$]). They also recommend that future studies in this domain include younger, active duty military members to enhance relevance to current behavioral health efforts among military service members and veterans.

Taken together, it is evident that exposure to suicide and suicide bereavement—and their association with suicidal thoughts and behaviors—are areas deserving of further empirical investigation among military service members and veterans. If experiences with suicide bereavement appear to be prevalent and/or to confer risk for suicide and the development of psychiatric symptoms in this population, then this may illuminate an important intervention avenue for military populations.

1.1. The present study

To better understand the experiences that United States military service members and veterans have had with knowing someone who has died by suicide, the aims of this study were:

Aim 1: To characterize service members' and veterans' experiences with suicide exposure, being affected by suicide, and/or suicide bereavement.

Aim 2: To examine the extent to which suicide exposure, *closeness* to a suicide decedent, and *impact* of a suicide death are each associated with service members' and veterans' own (a) lifetime history of suicidal thoughts, suicide plans, suicide attempts, and non-suicidal self-injury and (b) current suicidal symptom severity.

Aim 3: To investigate the extent to which *closeness* and *impact* are associated with service members' and veterans' (a) current suicidal symptom severity and (b) self-reported likelihood of a future suicide attempt, controlling for other suicidal symptoms and lifetime history of suicidal thoughts and behaviors.

2. Methods

2.1. Participants

A total of 1753 U.S. military service members and veterans were included in the present study. The current sample represents an aggregate of common data elements (CDEs) collected across fifteen independent studies funded by the Military Suicide Research Consortium (MSRC, 2015). The sample was predominantly male (81.5%), and individuals ranged in age from 18 to 88 years ($M=33.44$; $SD=13.38$). In terms of race, 64.8% identified as White, 19.7% Black/African American, 1.4% American Indian/Alaska Native, .9% Multiracial, .6% Asian, .3% Native Hawaiian/Other Pacific Islander, and 12.2% declined to state their race. For military service branch, 69.5% reported an Army affiliation, 12.9% Navy, 10.8% Marine Corps, 4.4% Air Force, .4% Coast Guard, .1% National Guard, and 2.0% other. Neither current military status (e.g., Active Duty, Reserve) nor rank was systematically collected across studies; thus, this information is not included in our analyses. For marital status, participants were most likely to report being single (41.1%), followed by married (28.3%), divorced (20.7%), separated (8.1%), widowed (.9%), and cohabitating (.8%). Finally, with respect to highest education level completed, 49.3% reported completing some college, 30.9% high school/GED, 12.2% a college degree, and 5.5% more than a college degree; 2.0% reported not completing high school.

2.2. Measures

The following measures were administered as a battery of CDEs across fifteen unique studies.² This assessment battery has been shown to have strong psychometric properties, including among military service member and veteran samples (Gutierrez and Joiner, 2016).

2.2.1. Demographics questionnaire

Demographic and military service characteristics were collected using a brief self-report questionnaire inquiring about sex, age, race, marital status, highest level of education completed, and branch of service.

2.2.2. Suicide exposure and bereavement experiences

Individuals responded to questions regarding their experiences knowing someone who had died by suicide. They were asked: "Do you know anyone who has died by suicide?" (Response options: Yes/No); "Did the death occur during your military career?" (Response options: Yes/No); "What was your relationship to the person who died by suicide?" (Open-ended response); "How close would you describe your relationship with this person?" (1="Not Close," 3="Somewhat Close," and 5="Very Close"); and "Thinking about the effect of the person's suicide on your life, please circle the most appropriate number below" (1="The death had little effect on my life," 2="The death had somewhat of an effect on me but did not disrupt my life," 3="The death disrupted my life for a short time," 4="The death disrupted my life in a significant or devastating way, but I no longer feel that way," and 5="The death had a significant or devastating effect on me that I still feel").

2.2.3. Depressive Symptom Inventory—Suicidality Subscale (DSI-SS; Metalsky and Joiner, 1997)

This 4-item self-report measure was used to assess current suicidal symptom severity. Individuals were presented with four groups of statements—each assessing a different domain of suicidality (e.g.,

² Although the Cerel et al. (2014) study was also funded by the Military Suicide Research Consortium, to prevent redundancies in reporting of findings, these data were not included in the present analyses.

frequency of suicidal thoughts, controllability of suicidal thoughts)—and then were asked to select the statement that best describes them in the past two weeks. DSI-SS total scores range from 0 to 12, with higher scores representing greater severity of symptoms. Past research suggests that the DSI-SS has strong psychometric properties (Joiner et al., 2002), including when compared to other self-report suicide risk measures (Batterham et al., 2014). The DSI-SS also demonstrated strong internal consistency in the present study ($\alpha=.90$).

2.2.4. Suicidal Behaviors Questionnaire—Revised (SBQ-R; Osman et al., 2001)

The SBQ-R is a 4-item self-report measure assessing various aspects of an individual's experiences with suicidal thoughts and behaviors. For the current study, Item 1 was used to assess lifetime history of suicide ideation, plans, and attempts (“Have you ever thought about or attempted to kill yourself?”), and Item 4 was used to assess self-reported future likelihood of a suicide attempt (“How likely is it that you will attempt suicide someday? ”; 0=“Never” to 6=“Very Likely”). The SBQ-R has been shown to have strong reliability and validity across clinical and non-clinical samples (Osman et al., 2001).

2.2.5. Interpersonal Needs Questionnaire—Thwarted Belongingness Subscale (INQ-TB; Gutierrez and Joiner, 2016; Van Orden et al., 2012)

An abbreviated 5-item version of the 9-item INQ-TB was used as a measure of thwarted belongingness (i.e., perception that one lacks meaningful social connections). According to the interpersonal theory of suicide (Joiner, 2005; Van Orden et al., 2010), thwarted belongingness is required for the emergence of suicidal desire. For the INQ-TB, participants rated each item on a 7-point Likert scale (1=“Not at all true for me,” 4=“Somewhat true for me,” 7=“Very true for me”). Total scores range from 5 to 35, with lower scores indicating greater thwarted belongingness. The INQ has been shown to have good internal consistency and predictive validity (Van Orden et al., 2012), including when a shortened version is utilized (Hill et al., 2015). The abbreviated INQ-TB used in this study demonstrated good internal consistency ($\alpha=.89$).

2.2.6. Non-suicidal self-injury (NSSI) measure

A single self-report item (“How many times in your life have you purposely hurt yourself *without* wanting to die?”), adapted from the Self-Injurious Thoughts and Behaviors Interview (Nock et al., 2007), was used to assess lifetime history of non-suicidal self-injury. Individuals who responded “0” were categorized as not having a lifetime history of NSSI, whereas those who provided a response ≥ 1 were categorized as having a lifetime history of NSSI.

2.3. Procedures

As noted, this study represents an aggregate of data collected across fifteen independent studies funded by the MSRC. Studies varied in recruitment strategies (e.g., community flyers, provider referral), study setting (e.g., university research laboratory, Veterans Affairs [VA] or military psychiatric inpatient unit, outpatient mental health clinic), survey administration method (e.g., computer-based, paper-and-pencil), and study design and aims (e.g., group treatment trial, web-based intervention study, neuroimaging investigation). Despite this, all participants in this study completed the same battery of self-report measures either at their baseline study visit or upon study enrollment. All participants provided informed consent prior to study enrollment, and the relevant Institutional Review Board(s) for each investigation approved all study procedures. The Department of Defense's Human Research Protection Office also verified compliance with all applicable human subjects policies.

Based on survey responses, participants were categorized as either

having known ($n=1004$) or not having known ($n=749$) someone who died by suicide. For participants who reported knowing someone who had died by suicide, each open-ended response to the question “What was your relationship to the person who died by suicide?” was coded as belonging to one of the following eleven categories: (1) Spouse/Romantic Partner; (2) Child (Daughter, Son); (3) Parent (Mother/Father); (4) Sibling (Sister, Brother); (5) Aunt, Uncle, Cousin; (6) Grandparent; (7) Other Family Member; (8) Friend; (9) Fellow Service Member (i.e., directly worked with service member); (10) Other Military Contact (i.e., did not directly work with service member); or (11) Other (e.g., Acquaintance, Co-worker).

2.4. Data analysis

For Aim 1, descriptive statistics were used to describe the prevalence of suicide exposure. For Aim 2, chi-square tests of independence were used to assess whether those who knew someone who had died by suicide were more likely to report a lifetime history of suicide ideation, plans, and attempts, as well as NSSI, than those who did not know a suicide decedent. One-way ANOVAs were utilized to evaluate differences in self-report symptom measure scores (i.e., DSI-SS total score, SBQ-R Item 4, INQ-TB total score) between (1) those who did and did not know someone who had died by suicide and (2) those who did and did not lose a fellow service member, specifically, to suicide. Additionally a series of univariate linear regression analyses were conducted to evaluate the extent to which (1) *closeness* to the suicide decedent and (2) *impact* of the suicide death were associated with scores on self-report symptom measures (DSI-SS total score, SBQ-R Item 4, INQ-TB total score) among those with exposure to suicide. Similarly, logistic regression analyses were employed to evaluate the extent to which *closeness* and *impact* were associated with self-reported lifetime suicide ideation, plans, and attempts, and NSSI.

Lastly, for Aim 3, two hierarchical linear regression analyses were implemented among those who had lost someone to suicide, specifically. This analytic approach was employed to investigate the unique contributions of lifetime suicidal thoughts and behaviors, current suicidal symptoms, and suicide bereavement experiences to current self-reported suicidal ideation and self-reported likelihood of a future attempt. The first analysis examined predictors of DSI-SS current suicidal ideation severity. Lifetime suicide ideation, plans, and attempts, and NSSI were entered in Step 1. Then, SBQ-R Item 4 and the INQ-TB total scores were entered in Step 2. Finally, *closeness* and *impact* were entered in Step 3. The second analysis examined predictors of SBQ-R likelihood of a future suicide attempt. Again, lifetime suicide ideation, plans, and attempts, and NSSI were entered in Step 1. Next, DSI-SS and INQ-TB total scores were entered in Step 2. Finally, both *closeness* and *impact* were entered in Step 3.

Of note, additional exploratory analyses were conducted to evaluate whether the pattern of findings for each analysis described above remained the same after controlling for age, sex, and marital status. Follow-up chi-square tests, one-way ANOVAs, and moderation analyses were also conducted to examine the role of male and female sex in our findings. These analyses were not conducted with age and marital status given that these characteristics were likely different at the time of exposure to suicide, which would limit the interpretability of results.

3. Results

Means, standard deviations, and zero-order correlations for all self-report measures are presented in Table 1.

3.1. Experiences with suicide exposure

Suicide exposure experiences are presented in Table 2. A total of 1004 (57.3%) participants reported knowing someone who had died by suicide, and of these individuals, 43.3% reported that a suicide death

Table 1
Means, standard deviations, and zero-order correlations of self-report measures.

	1	2	3	4	5
1. DSI-SS Suicidal Ideation	–				
2. INQ Thwarted Belongingness	-.34**	–			
3. SBQ-R Item 4 Future Likelihood	.72**	-.41**	–		
4. Closeness to Decedent	.12**	-.09*	.20**	–	
5. Impact of Death	.18**	-.08*	.24**	.63**	–
M	2.01	20.04	1.34	2.98	2.60
SD	2.84	8.26	1.64	1.38	1.34
Range	0–12	5–35	0–6	1–5	1–5
α	.90	.90	–	–	–

Note. DSI-SS=Depressive Symptom Inventory–Suicidality Subscale; INQ=Interpersonal Needs Questionnaire; SBQ-R=Suicidal Behaviors Questionnaire-Revised.

* $p < .05$.

** $p < .01$.

Table 2
Factors among Participants Reporting Suicide Exposure (N=1004).

	n	Valid %
Relationship to Individual Who Died by Suicide^a		
Spouse/Romantic Partner	16	1.7%
Child (Daughter, Son)	3	.3%
Parent (Mother, Father)	19	1.9%
Sibling (Sister, Brother)	25	2.6%
Aunt, Uncle, Cousin	84	8.9%
Grandparent	10	1.1%
Other Family Member	82	8.7%
Friend	502	53.1%
Fellow Service Member	100	10.6%
Other Military Contact	21	2.2%
Other (Acquaintance, Co-worker, etc.)	180	19.0%
Suicide Death Occurred During Military Career		
No	555	56.7%
Yes	423	43.3%
Missing	26	–
Closeness of Relationship with Suicide Decedent (M=3.01, SD=1.36)		
1=Not Close	187	19.3%
2	154	15.9%
3=Somewhat Close	273	28.2%
4	172	17.8%
5=Very Close	182	18.8%
Missing	35	–
Effect of Death on Participant's Life (M=2.62, SD=1.34)		
1=Little effect on life	215	22.2%
2=Somewhat of an effect but did not disrupt life	298	30.8%
3=Disrupted life for a short time	196	20.2%
4=Disrupted life in a significant or devastating way, but no longer feel that way	122	12.6%
5=Significant or devastating effect that is still felt	131	13.5%
Missing	42	–

^a Categories are not mutually exclusive.

had occurred during their military careers. Participants most commonly reported losing a Friend ($n=502$; 53.1%), followed by Other ($n=180$; 19.0%); Fellow Service Member ($n=100$; 10.6%); Aunt, Uncle, Cousin ($n=84$; 8.9%); Other Family Member ($n=82$; 8.7%); Sibling ($n=25$; 2.6%); Other Military Contact ($n=21$; 2.2%); Parent ($n=19$; 1.9%); Spouse/Romantic Partner ($n=16$; 1.7%); Grandparent ($n=10$; 1.1%); and Child ($n=3$; .3%). A plurality of participants ($n=273$; 28.2%) who had known someone who died by suicide reported being “Somewhat Close” to the suicide decedent, and a plurality ($n=298$; 30.8%) also reported that the suicide death had “Somewhat of an effect but did not disrupt life.”

Table 3
History of lifetime suicide ideation, plans, and attempts, and non-suicidal self-injury in association with knowing someone who died by suicide.

	Knows someone who died by suicide				χ^2	p
	Yes (n=1004)		No (n=749)			
	N	Valid %	N	Valid %		
Lifetime Suicidal Ideation	680	67.7%	334	44.6%	94.168	< .001
Lifetime Suicide Plans	535	53.3%	257	34.3%	62.357	< .001
Lifetime Suicide Attempts	291	29.0%	123	16.4%	37.527	< .001
Lifetime Non-Suicidal Self-Injury	291	29.0%	119	15.9%	41.061	< .001

3.2. Suicide exposure and lifetime suicidal behaviors/current suicidal symptoms

Suicide-exposed individuals were significantly more likely than those not exposed to suicide to report a lifetime history of suicide ideation ($\chi^2=94.168$, $p < .001$), suicide plans ($\chi^2=62.357$, $p < .001$), suicide attempts ($\chi^2=37.527$, $p < .001$), and NSSI ($\chi^2=41.061$, $p < .001$). These data are detailed in Table 3.

Participants who reported exposure to suicide reported more severe DSI-SS current suicidal ideation ($F[1,1666]=43.822$, $p < .001$, $M_{Yes}=2.40$, $M_{No}=1.48$) and a greater SBQ-R likelihood of a future suicide attempt ($F[1,1666]=64.160$, $p < .001$, $M_{Yes}=1.61$, $M_{No}=.97$). There were no differences between the two groups with respect to INQ thwarted belongingness ($F[1,1017]=.089$, $p=.766$, $M_{Yes}=19.99$, $M_{No}=20.15$). Of note, individuals who reported losing a fellow service member to suicide ($n=100$) did not report more severe DSI-SS current suicidal ideation ($F[1,910]=.322$, $p=.570$), greater SBQ-R likelihood of a future suicide attempt ($F[1,917]=.705$, $p=.401$), or INQ thwarted belongingness ($F[1,681]=.982$, $p=.322$) than individuals who reported losing a non-fellow service member (i.e., other military contact) to suicide.

3.3. Closeness to suicide decedent and lifetime suicidal behaviors/current suicidal symptoms

Participants who reported greater closeness to the suicide decedent also reported more severe DSI-SS current suicidal ideation ($\beta=.110$, $t[925]=3.361$, $p=.001$, partial $r^2=.012$), greater SBQ-R likelihood of a future suicide attempt ($\beta=.191$, $t[926]=5.934$, $p < .001$, partial $r^2=.036$), and greater INQ thwarted belongingness ($\beta=-.085$, $t[684]=-2.242$, $p=.025$, partial $r^2=.007$). Logistic regression analyses revealed that those who reported greater closeness to the suicide decedent were also more likely to report a lifetime history of suicidal ideation ($B=.229$, $SE=.052$, $p < .001$), suicide plans ($B=.215$, $SE=.048$, $p < .001$), and suicide attempts ($B=.183$, $SE=.052$, $p < .001$), but not NSSI ($B=.094$, $SE=.052$, $p=.071$). Findings are presented in Tables 4 and 5.

3.4. Impact of suicide death and lifetime suicidal behaviors/current suicidal symptoms

Individuals reporting a greater negative impact of a suicide death on their lives also reported more severe DSI-SS current suicidal ideation ($\beta=.174$, $t[925]=5.389$, $p < .001$, partial $r^2=.030$), SBQ-R likelihood of a future attempt ($\beta=.233$, $t[926]=7.290$, $p < .001$, partial $r^2=.054$), and INQ thwarted belongingness ($\beta=-.078$, $t[684]=-2.044$, $p=.041$, partial $r^2=.006$). Logistic regression analyses indicated that

Table 4

Univariate linear regression with closeness to suicide decedent and impact of suicide death predicting self-report symptom measure severity.

	R^2	β	t	p	partial r^2
DSI-SS Suicidal Ideation					
Closeness to Suicide Decedent	.012	.110	3.361	.001	.012
Impact of Suicide Death	.030	.174	5.389	< .001	.030
SBQ-R Future Likelihood of a Suicide Attempt					
Closeness to Suicide Decedent	.037	.191	5.934	< .001	.036
Impact of Suicide Death	.054	.233	7.290	< .001	.054
INQ Thwarted Belongingness					
Closeness to Suicide Decedent	.007	-.085	-2.242	.025	.007
Impact of Suicide Death	.006	-.078	-2.044	.041	.006

Note. DSI-SS=Depressive Symptom Inventory–Suicidality Subscale; SBQ-R=Suicidal Behaviors Questionnaire-Revised; INQ=Interpersonal Needs Questionnaire.

Table 5

Logistic regression with closeness to suicide decedent and impact of suicide death predicting lifetime suicidal behavior type.

	B	SE	Wald	p
Lifetime Suicidal Ideation				
Closeness to Suicide Decedent	.229	.052	19.535	< .001
Impact of Suicide Death	.439	.059	55.105	< .001
Lifetime Suicide Plan				
Closeness to Suicide Decedent	.215	.048	19.866	< .001
Impact of Suicide Death	.363	.052	49.369	< .001
Lifetime Suicide Attempt				
Closeness to Suicide Decedent	.183	.052	12.153	< .001
Impact of Suicide Death	.243	.053	21.281	< .001
Lifetime Non-Suicidal Self-Injury				
Closeness to Suicide Decedent	.094	.052	3.265	.071
Impact of Suicide Death	.142	.052	7.390	.007

greater negative impact of a suicide death was also associated with a greater likelihood of reporting a lifetime history of suicidal ideation ($B=.439$, $SE=.059$, $p<.001$), suicide plans ($B=.363$, $SE=.052$, $p<.001$), suicide attempts ($B=.243$, $SE=.053$, $p<.001$), and NSSI ($B=.142$, $SE=.052$, $p=.007$). Results are presented in Tables 4, 5.

3.5. Predictors of current suicidal ideation severity and likelihood of a future suicide attempt

Findings from hierarchical multiple linear regression analyses are presented in Table 6. Greater self-reported closeness to the suicide decedent was associated with less severe DSI-SS current suicidal ideation ($\beta=-.079$, $t[636]=-2.050$, $p=.041$, partial $r^2=.002$), controlling for lifetime suicide ideation, plans, and attempts; SBQ-R likelihood of a future suicide attempt; INQ thwarted belongingness; and suicide death impact. The overall model including all variables was also significant ($F[8,636]=55.336$, $p<.001$), accounting for 41.0% of the variance in DSI-SS current suicidal ideation scores; however, the change in R^2 values between Steps 2 and 3 was not significant ($F[2,636]=2.201$, $p=.112$). Greater self-reported closeness to the suicide decedent was also associated with reporting a greater likelihood of making a future suicide attempt ($\beta=.095$, $t[636]=2.550$, $p=.011$, partial $r^2=.010$), controlling for lifetime suicide ideation, plans, and attempts; DSI-SS current suicidal ideation; INQ thwarted belongingness; and suicide death impact. Again, the overall model including all variables was significant ($F[8,636]=64.716$, $p<.001$), accounting for 44.9% of the variance in SBQ-R Item 4 scores; however for these analyses, the change in R^2 values between Steps 2 and 3 was significant

($F[2,636]=5.016$, $p=.007$).

Additionally, when these analyses were conducted excluding individuals who reported knowing a family member who died by suicide, the pattern of findings remained the same. This indicates that the impact of suicide bereavement on one's suicidal symptoms that was found in the present study was likely not merely a manifestation of genetic transmission (e.g., see Brent and Mann [2005], Brent and Melhem [2008], Brent et al. [2004]).

3.6. Exploratory analyses with demographic variables

The patterns of findings described above remained the same after accounting for the effects of age, sex, and marital status. Follow-up chi-square tests revealed that, of those exposed to suicide, females were significantly more likely than males to report a lifetime history of NSSI (37.8% of females, 27.1% of males; $\chi^2=8.433$, $p=.003$), but not suicide ideation, plans, or attempts. Follow-up one-way ANOVAs did not reveal sex differences in severity of self-reported current suicidal symptoms among those exposed to suicide ($ps>.05$). Finally, moderation analyses did not indicate that sex was a significant moderator of the relationships between (1) closeness to a suicide decedent and current suicidal symptoms ($ps>.05$); or (2) impact of suicide death and current suicidal symptoms ($ps>.05$).

4. Discussion

This study aimed to describe the prevalence of exposure to suicide, as well as the associations between suicide exposure and indices of suicide risk, among a large sample of military service members and veterans. Findings revealed that the majority of military service members and veterans (57.3%) had been exposed to suicide. In turn, being exposed to suicide, greater closeness to a suicide decedent, and greater perceived negative impact of the suicide death on one's life were each significantly associated with elevated rates of lifetime suicidal thoughts and behaviors, rates of lifetime NSSI (with rates higher among females), current suicidal symptoms, and self-reported likelihood of a future suicide attempt. Notably, these findings remained even after controlling for sex, age, and marital status, which strengthens our confidence in the generalizability of our findings. Most strikingly, greater closeness to a suicide decedent was significantly associated with greater self-reported likelihood of a future suicide attempt, even when controlling for other suicide risk factors. These findings have numerous implications for research, clinical work, and military mental health, each of which will be detailed below.

First, the results of this study extend a growing body of literature documenting the ways in which the tragedy of suicide afflicts not only the suicide decedent but also the bereaved (for reviews, see Cerel et al. [2008], Pitman et al. [2014]). Our pattern of findings was consistent with the aforementioned study of military veterans (Cerel et al., 2015). In this study, they found a similar rate of exposure to suicide as well as significant associations between prior suicide exposure and current suicidal ideation among their participants. Together, our study and theirs begin to paint a picture of the potentially troubling effects of suicide bereavement among military populations—specifically, that loss of a loved one, friend, and/or peer to suicide may increase one's own risk for suicide. Important to note, the mean age of participants in the Cerel et al. (2014) study was markedly higher than that of the present study sample (61.6 ± 15.42 years and 33.44 ± 13.38 years, respectively). It is likely, then, that rates of exposure to suicide may effectively be significantly higher in this sample than in the Cerel et al. (2014) study when accounting for the longer time frame in which exposure to suicide may have occurred. This is not surprising given the increasing rates of suicide observed in the military in recent years (Kuehn, 2009) and, again, emphasizes the critical need to better understand the impact of suicide bereavement on military service members and veterans. The finding that exposure to suicide was associated with

Table 6

Multiple hierarchical linear regression examining predictors of current suicidal ideation severity and likelihood of a future suicide attempt.

	R^2	p (F -Change)	β	t	p	partial r^2
Dependent Variable: DSI-SS Current Suicidal Ideation Severity						
Step 1:	.193	–				
Lifetime Suicidal Ideation			.130	2.951	.003	.013
Lifetime Suicide Plan			.290	6.026	< .001	.054
Lifetime Suicide Attempt			.080	1.924	.055	.006
Lifetime Non-Suicidal Self-Injury			.052	1.415	.158	.003
Step 2:	.406	< .001				
Lifetime Suicidal Ideation			.038	.992	.322	.002
Lifetime Suicide Plan			.149	3.514	< .001	.019
Lifetime Suicide Attempt			.033	.913	.361	.001
Lifetime Non-Suicidal Self-Injury			–.012	–.370	.711	< .001
SBQ-R Future Suicide Attempt			.485	13.473	< .001	.365
INQ Thwarted Belongingness			–.100	–3.018	.003	.104
Step 3:	.410	.112				
Lifetime Suicidal Ideation			.038	1.001	.317	.002
Lifetime Suicide Plan			.149	3.522	< .001	.019
Lifetime Suicide Attempt			.035	.968	.333	.001
Lifetime Non-Suicidal Self-Injury			–.012	–.388	.698	< .001
SBQ-R Future Suicide Attempt			.491	13.606	< .001	.226
INQ Thwarted Belongingness			–.101	–3.066	.002	.015
Closeness to Suicide Decedent			–.079	–2.050	.041	.002
Impact of Suicide Death			.034	.880	.379	.006
Dependent Variable: SBQ-R Future Likelihood of a Suicide Attempt						
Step 1:	.223	–				
Lifetime Suicidal Ideation			.160	3.710	< .001	.021
Lifetime Suicide Plan			.266	5.622	< .001	.047
Lifetime Suicide Attempt			.088	2.165	.031	.007
Lifetime Non-Suicidal Self-Injury			.122	3.396	.001	.018
Step 2:	.440	< .001				
Lifetime Suicidal Ideation			.079	2.140	.033	.132
Lifetime Suicide Plan			.114	2.763	.006	.180
Lifetime Suicide Attempt			.045	1.296	.196	.085
Lifetime Non-Suicidal Self-Injury			.092	2.994	.003	.048
DSI-SS Suicidal Ideation			.457	13.473	< .001	.222
INQ Thwarted Belongingness			–.149	–4.687	< .001	.033
Step 3:	.449	.007				
Lifetime Suicidal Ideation			.076	2.052	.041	.132
Lifetime Suicide Plan			.109	2.656	.008	.180
Lifetime Suicide Attempt			.042	1.210	.227	.085
Lifetime Non-Suicidal Self-Injury			.091	2.992	.003	.048
DSI-SS Suicidal Ideation			.459	13.606	< .001	.365
INQ Thwarted Belongingness			–.143	–4.517	< .001	.129
Closeness to Suicide Decedent			.095	2.550	.011	.010
Impact of Suicide Death			–.002	–.056	.955	< .001

Note. DSI-SS=Depressive Symptom Inventory–Suicidality Subscale; SBQ-R=Suicide Behaviors Questionnaire-Revised; INQ=Interpersonal Needs Questionnaire.

higher lifetime rates of NSSI among females than males especially warrants further investigation given that rates of NSSI in the general population are not associated with sex (Klonsky, 2011) and that little is known about NSSI among service members and veterans.

Second, although closeness to a suicide decedent was both positively associated with current suicidal ideation and self-reported likelihood of a future attempt in univariate analyses, after controlling for the effects of lifetime suicidal thoughts and behaviors and other suicidal symptoms, the direction of the association between closeness and current suicidal ideation was reversed. That is, closeness to a suicide decedent was still positively associated with self-reported likelihood of a future attempt but now was negatively associated with current suicidal ideation. What might account for this seeming paradox? For one, it is important to highlight that differential pathways likely account for the emergence of suicidal ideation and suicide attempts (Klonsky and May, 2014). Moreover, it is plausible that current suicidal ideation, which itself is a symptom of major depressive disorder (American Psychiatric Association, 2013) and may not signal an actual threat to life (i.e., often, although not always, in the case of passive suicide ideation), is a more fluid construct than future likelihood of a suicide attempt. This finding is additionally consistent with prior research revealing differential relationships between closeness to

a suicide decedent and subsequent risk of suicidal ideation and suicide attempts (Brent et al., 1993a,b). Finally, these individuals may view suicide as more acceptable or possible now that someone close to them has died by suicide, and therefore, may be more likely envision themselves dying by suicide—a point that will be discussed below.

Third, in understanding the effects that suicide has on the bereaved, whether the suicide decedent was a family member, friend, co-worker, or roommate, there are several factors that may serve as potential mechanistic explanations, either independently or in conjunction with one another. Potential mechanistic links include suicide contagion (Cox et al., 2012; Joiner, 1999); genetic effects whereby psychiatric disorders are pre-morbidly transmitted from decedent to offspring (Brent and Mann, 2005; Brent et al., 2004); assortative relating, whereby individuals with risk factors for suicide are prone to comingle (Joiner, 2003); maladaptive bereavement responses (American Psychiatric Association, 2013); and/or more permissible attitudes about suicide (Renberg and Jacobsson, 2003). Past research among adolescents exposed to a peer's suicide also suggests that the negative impact of exposure to suicide may be especially potent among those with a prior history of stressful life events (Swanson and Colman, 2013) and feelings of accountability for the suicide death (Bridge et al., 2003). The current study is not positioned to definitively claim that one or

more of these processes are at play among military service members and veterans, though research and future work in this domain would benefit from investigation of these processes.

Regardless of the mode of transmission, that military service members and veterans bereaved by suicide may subsequently be at elevated risk for suicidal thoughts and behaviors warrants empirical and clinical attention. In the same way that treatment engagement and connection to mental health services are critical among suicidal individuals (Hom et al., 2015), it is important to ensure that service members and veterans bereaved by suicide also receive high-quality, evidence-based care. Indeed, spouses and first-degree relatives bereaved by suicide have been found to have a greater perceived need for professional help than those who have lost a spouse or first-degree relative to another cause of death (de Groot et al., 2006). Individuals bereaved by suicide may also experience a more complicated presentation of grief than individuals bereaved by natural causes of death (e.g., physical illness; Barrett and Scott, 1990; de Groot et al., 2006; Rings et al., 2014).

To address this need for mental health services, past research suggests that support groups for service members and veterans bereaved by suicide may be particularly helpful, in part because they are both cost-effective and highly disseminable (Barlow et al., 2010; Cerel et al., 2009; see also Schneider et al., 2011). However, prior to dissemination among military populations, further work is needed to empirically test the efficacy of these interventions utilizing a randomized controlled trial design. Whether the clinical modality is treatment or assessment, it is additionally important to consider that an individual bereaved by suicide may have more negative views towards mental health treatment (Ward-Ciesielski et al., 2015). In this regard, it may be useful to empathize and emphasize that the health care system did indeed fail; however, it is the clinician's goal to ensure suicide—including among those bereaved by suicide—does not occur moving forward (cf., Zero Suicide [<http://zerosuicide.sprc.org>]).

Lastly, it is also noteworthy that empirically-informed suicide risk assessment and management frameworks often include questions probing if the patient has experienced the death by suicide of a family member (Chu et al., 2015). This question is likely included in standardized frameworks to account for genetically transmitted risk for suicide (e.g., see Brent and Mann [2005], Brent and Melhem [2008], Brent et al. [2004]), and the patient's answer to this question typically does not yield actionable steps to the same degree as, for instance, current plans or preparations for a suicide attempt. Despite this, our study's findings suggest that a simple additional probe inquiring whether an individual has been close to anyone who died by suicide (i.e., not only a genetic relative) may aid in risk detection and have clinical utility.

4.1. Limitations and future directions

To our knowledge, this study is among the first to examine the psychological impact of suicide exposure among military service members and veterans; however, its limitations must also be noted. First, its use of cross-sectional data limited our ability to investigate the temporal relationship between participants' exposure to suicide and their own suicidal thoughts and behaviors. Similarly, data were not available on when reported suicide deaths had occurred; thus, we were unable to control for "time since event" in analyses or to determine time effects. Consequently, prospective studies will be critical in delineating the relationship between these experiences. Second, future studies may benefit from utilization of structured response options rather than open-ended responses when probing participants' relationship to a suicide decedent. Third, it remains unknown whether respondents had been directly exposed to the suicide death itself (e.g., finding the deceased's body). Fourth, given the relatively low mean scores for self-reported likelihood of a future attempt, it is recommended that these findings be interpreted with caution. Further

investigation is warranted to replicate these results. Fifth, data were pooled across a variety of studies (e.g., community samples, treatment trials), these studies selected for specific populations (e.g., veterans at elevated suicide risk), and representative sampling strategies were not utilized, limiting the generalizability of findings. However, as noted above, that our pattern of findings remained after controlling for demographic characteristics strengthens our confidence in our results. Finally, data were not available regarding key military metrics, including whether individuals were current military service members or veterans, years of service, time since separation (for veterans), and deployment history and status. These variables may serve as important moderators of the relationship between exposure to suicide and service members' and veterans' future suicide risk. Investigation of whether methods, too, are contagious—a point consistent with familiarity with means posited by the capability construct of the interpersonal theory of suicide—may also be informative (Joiner, 2005; Van Orden et al., 2010).

Despite the clear need for research investigating suicide bereavement among military service members and veterans, in addition to general population samples, this work is not without its challenges. Challenges include potential difficulties interfacing with institutional review boards (Hom et al., 2016; Moore et al., 2013) and inexcusable misperceptions that issues surrounding suicide bereavement (cf., postvention) are intended strictly for the clinical, rather than empirical, domain (Moore et al., 2013). By delineating the underlying mechanisms that account for the relationship between suicide bereavement and psychiatric symptoms, we may then be able to enhance our identification of potentially lifesaving treatment targets.

5. Conclusions

Converging evidence across multiple populations suggests that exposure to suicide may have a significant impact on individuals' own psychological functioning, including increased risk for suicidal thoughts and behaviors. The current study extended this line of research by examining the impact of suicide exposure on military personnel and veterans, specifically. These preliminary findings suggest that service members who report being bereaved by suicide are themselves at increased suicide risk. This appears to be especially true among those reporting greater closeness to the suicide decedent, with effects observed even when controlling for current suicidal symptoms and prior suicidal thoughts and behaviors. As research and clinical work remains deservedly focused on finding ways to prevent suicide deaths, complementary efforts are needed to better understand the experiences of those left in their wake. This may dramatically enhance both upstream suicide prevention efforts as well as suicide-specific interventions.

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Staring Down Death

Is Abnormally Slow Blink Rate a Clinically Useful Indicator of Acute Suicide Risk?

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Abstract. *Background:* Lowered eye blink rate may be a clinically useful indicator of acute, imminent, and severe suicide risk. Diminished eye blink rates are often seen among individuals engaged in heightened concentration on a specific task that requires careful planning and attention. Indeed, overcoming one's biological instinct for survival through suicide necessitates premeditation and concentration; thus, a diminished eye blink rate may signal imminent suicidality. *Aims:* This article aims to spur research and clinical inquiry into the role of eye blinks as an indicator of acute suicide risk. *Method:* Literature relevant to the potential connection between eye blink rate and suicidality was reviewed and synthesized. *Results:* Anecdotal, cognitive, neurological, and conceptual support for the relationship between decreased blink rate and suicide risk is outlined. *Conclusion:* Given that eye blinks are a highly observable behavior, the potential clinical utility of using eye blink rate as a marker of suicide risk is immense. Research is warranted to explore the association between eye blink rate and acute suicide risk.

Keywords: suicide, eye blink, blink rate

A man videotapes himself near a bunker he meticulously built in the woods near Seattle, Washington. In the video, the man looks into the camera and explains that he has chosen to murder his wife and daughter, and to either survive in the woods, living off occasional robberies, or to die by self-inflicted gunshot wound (King County Sheriff's Office [KingscPIO], 2012). In fact, he did kill his wife and daughter, and 5 days later died in the bunker by self-inflicted gunshot wound.

The videotape is remarkable for its callous words – an investigator described the tape as “breathhtaking in its evil” (King County Sheriff's Office, 2012). But it is remarkable for another fact as well: As the perpetrator describes his plan, he stares directly into the camera for approximately 45 s, during which he does not blink once (the average person blinks once every 4 s or so).

In a separate incident, a man in southern California videotapes himself describing how life has been unfair to him; in particular, he states that women have been bewilderingly and unjustifiably disinterested in him, and that he resents sexually active men to whom he perceives life has been fairer (New York Times, 2014). He blinks not once for a 30-s segment of his statement. Later that day, he murdered six people, including two women at a sorority house, and then died by self-inflicted gunshot wound.

In December 2005, a young man was evaluated in a mental health facility in the vicinity of Blacksburg, Virginia. The evaluation was occasioned by some vague threats of suicide made by the young man to roommates. The evaluation reads, “The patient denies suicidal ideation... patient very non-verbal, very quiet, sits in the chair looking down at the floor... Patient does not blink” (Miglani & Coats, 2005). Deemed not to be a danger, the young man was released. Months later, this young man – Seung-Hui Cho – perpetrated a horrific murder–suicide at Virginia Tech. The months-long interval between the evaluation and the incident raises the interesting possibility that blink rate may have both state-like and trait-like properties, a point with implications for risk assessment and one to which we will return. In addition, videos Cho made in the days before the atrocity showed a relatively normal blink rate, suggesting that the rule that applies to all known clinical risk factors applies to blink rate too – namely, no single factor by itself is reliably pathognomonic. Cho's videos did, however, reveal a distinct blink rate abnormality: frequent partial blinks. We will return to this point as well.

Each incident described thus far includes multiple homicides, as well as suicide. Perhaps altered blink rate may therefore be more so a feature of violence toward others than of self-directed violence. We are not convinced of

this, however, in light of several examples of a similar nature (e.g., through one of our forensic practices) involving death by suicide only.

The purpose of this article is to ask whether these anecdotes are generalizable; that is, whether lowered blink rate might be a marker for acute, imminent, and/or severe/stable suicide risk. We emphasize that we are asking a question more than answering one, and we hope to stimulate future research on the question. In what follows, we briefly review and synthesize relevant scholarship on various aspects of blink rate and conjecture how they may relate to suicidality.

Blink Rate, Depression, and Suicidality

To our knowledge, there is no systematic empirical evaluation of whether blink rate may be an indicator of suicide risk, specifically. We are aware of one study in which blink rate was significantly increased in depressed patients as compared with controls (Mackintosh, Kumar, & Kitamura, 1983). Interestingly, this same study found that depressed individuals' blink rate normalized with treatment. Taken together with the aforementioned anecdotes, and many others not mentioned, this study may suggest that blink rate is elevated among nonsuicidal depressed patients but slowed among suicidal depressed individuals (cf. Joiner, 2014). However, suicide risk was not reported in the Mackintosh et al. (1983) study. Given the potential value of a risk marker such as blink rate, which is highly unobtrusive and readily available for clinical observation, this represents an important and novel area for research.

Blink Rate and Cognitive Performance

To understand the potential role of blink rate in characterizing suicide risk, it will be helpful to contextualize the issue within what is known about blink rate and cognition more generally. Several studies support the notion that demanding tasks and focused attention are associated with a decreased rate of blinking. For instance, one study found that, although an elevated blink rate was associated with increased cognitive flexibility and the ability to switch between tasks, those with higher blink rates were also more distractible (Dreisbach et al., 2005). Conversely, in the same study, participants with lower blink rates showed greater cognitive stability. A more recent study found that the relationship between cognitive flexibility and blink rate appears to follow an inverted U-shape function, with individuals exhibiting very low and very high blink rates demonstrating the lowest flexibility (Chermahini & Hommel, 2010). Both studies suggest that a lower blink rate may be related to heightened concentration on a specific task.

Eye blink rates also appear to vary depending on the level of attention that a task demands. Initial research

identified eye blink rate as a possible indicator of task-induced fatigue (Stern, Boyer, & Schroeder, 1994), with follow-up studies confirming the association between decreased blink rates and increased cognitive workload and required attention (Wilson, 2002; Yamada, 1998). A recent systematic review of eye blinking, fatigue, and mental load found that, across studies, eye blinking was a useful marker of mental load, with decreased blinking observed particularly during the performance of complex tasks (Martins & Carvalho, 2015). Taken together, these studies suggest that a decreased blink rate may be an indicator of greater effortful attention and focus on a single task. As will be elaborated further in this article, this bears relevance to eye blink rates that might be expected among individuals at imminent risk for suicide (who, unfortunately, are directing their attention and focus toward self-harm). Relatedly, since executive function and inhibitory control deficits may be characteristic of individuals who are at elevated risk for suicide and who have a history of traumatic brain injury (TBI; Hommaifar, Brenner, Forster, & Nagamoto, 2012; Keilp et al., 2001; Richard-Devantoy et al., 2012), it is possible that decreased blink rates are especially prominent among acutely suicidal individuals with TBI since increased efforts are likely required to compensate for cognitive deficits and sustain a high level of focus.

Neural Mechanisms of Blink Rate

In considering the link between eye blink rate and suicide risk, it will also be useful to establish the neural mechanisms that underlie eye blink rates. Researchers have identified spontaneous eye blink rate as a clinical indicator of dopaminergic functioning. In particular, very low and very high eye blink rates seem to correspond to abnormally low and high levels of dopamine activity, respectively (Deuschl & Goddemeier, 1998; Ladas, Frantzidis, Bamidis, & Vivas, 2014). Indeed, past research has demonstrated that dopaminergic activity in the striatum – specifically within the caudate nucleus, which is heavily innervated by dopamine neurons – influences blink rates (Karson, 1983; Taylor et al., 1999). Accordingly, individuals with impairments in dopaminergic functioning, such as patients with Parkinson's disease (Deuschl & Goddemeier, 1998) and chronic cannabis and cocaine users (Colzato, van den Wildenberg, & Hommel, 2008; Kowal, Colzato, & Hommel, 2011), exhibit decreased eye blink rates. By contrast, accelerated blink rates are found among individuals with schizophrenia (Freed et al., 1980), a disorder characterized by an abundance of dopamine (Mackay et al., 1982). As expected, greater eye blink rates have also been found in individuals scoring higher on Eysenck's psychoticism scale (Colzato, Slagter, van den Wildenberg, & Hommel, 2009). Interestingly, whereas neuroleptic treatment of individuals with schizophrenia attenuates blinking (Karson, Freed, Kleinman, Bigelow, & Wyatt, 1981), dopamine agonists increase eye blink rates in humans (Blin, Mas-

son, Azulay, Fondarai, & Serratrice, 1990) and monkeys (Kleven & Koek, 1996). Overall, these findings indicate that blink rates may be significantly influenced by dopaminergic activity.

The next topic of interest is whether these neural mechanisms support the conjecture set forth herein; the evidence thus far is mixed. There is research to suggest that diminished dopaminergic transmission may be associated with suicidal behavior among depressed patients (Roy, Karoum, & Pollack, 1992). However, given that many factors related to mental disorders may influence dopaminergic functioning, findings regarding the dopaminergic system and suicide risk have been equivocal (Currier & Mann, 2008). For example, tetrahydrocannabinol (THC), the chemical in marijuana chiefly responsible for its psychoactive effects, affects dopaminergic functioning. As expected, past research has demonstrated that marijuana use may decrease blink rates (Kowal et al., 2011). By contrast, one potential side effect of medications commonly used to treat psychiatric disorders related to suicide (e.g., the antipsychotic and mood stabilizer quetiapine, in the case of bipolar disorder or schizophrenia; selective serotonin reuptake inhibitors sertraline and paroxetine, in the case of mood or anxiety disorders; and tricyclic antidepressants) is dry eyes – a condition that may have a potentiating effect on blink rate. These findings suggest that when investigating eye blink rates among individuals with mental disorders, particularly severe disorders with which there is attendant suicidality, substance and medication use should be carefully considered in the methodological design. Common medical procedures (e.g., laser eye surgery) and nonpsychiatric medications (e.g., antihistamines) that may influence blink rate will also be important to consider. Given that phenotypic changes in eye blink rate may represent a manifestation of dysregulated dopamine levels and increased suicide risk, this area represents a crucial line of study.

In addition to dysregulation in dopaminergic functioning, dysregulation in the serotonergic system is considered one of the most robust neurobiological indicators of risk for suicide and suicidal behaviors (Joiner, Johnson, & Soderstrom, 2002; for review, see Mann, 2013, and Pandey, 2013). As one example, findings from a meta-analysis revealed that the presence of a particular allele within the serotonin system – that is, the A218 polymorphism of the tryptophan hydroxylase (TPH) gene – is strongly associated with suicidal behavior (Rujescu, Giegling, Sato, Hartmann, & Möller, 2003). Although the serotonergic system has not been directly linked to eye blink rate mechanisms, abnormalities in this system have been connected to the impulsive–aggressive behavioral trait (Oquendo & Mann, 2000; Placidi et al., 2001). As will be discussed in the next section, this trait may confer risk for suicidal behaviors (Baca-García et al., 2001), which demand a high degree of focus, and by extension, may lead to potentially reduced eye blink rates.

Conceptual Foundations for the Relationship Between Blink Rate and Suicide Risk

There are a number of conceptual reasons to believe that individuals at imminent risk for suicide may demonstrate a decreased rate of blinking. As mentioned previously, a focused, unblinking gaze is often associated with increased resolve and concentration, both of which are likely features of an individual with a high intent to die by suicide. Put simply, suicide is extremely daunting, frightening, and painful, and defying one's biological instinct for survival necessitates immense fearlessness and focus.

Case studies describing the methods by which individuals die by suicide make it clear that engaging in suicidal behavior is difficult and requires a markedly elevated tolerance for physical pain (Holm-Denoma et al., 2008). The sheer difficulty of enacting such a degree of harm to oneself likely accounts for why most individuals with thoughts of suicide ultimately do not attempt suicide (Joiner, 2005; Van Orden et al., 2010). For example, one study found that fear of suicide distinguished individuals who had engaged in suicidal behaviors from those only reporting past serious thoughts about suicide (Linehan, Goodstein, Nielsen, & Chiles, 1983). Several studies have also supported this idea put forth by the interpersonal theory of suicide (Joiner, 2005; Van Orden et al., 2010), which suggests that individuals must have both the desire and capability for suicide (i.e., fearlessness of death, elevated pain tolerance) in order to enact lethal self-harm (Ribeiro, Silva, & Joiner, 2014; Smith, Cukrowicz, Poindexter, Hobson, & Cohen, 2010; Van Orden, Witte, Gordon, Bender, & Joiner, 2008). Consequently, it seems reasonable that prior to a suicide attempt, individuals would be noticeably focused and unblinking as they prepare to carry out something that is inordinately terrifying and painful. That is, these individuals are staring down death.

The level of resolve involved in making a suicide attempt also suggests a degree of planning and careful thinking, which might be expected to present itself in the form of a determined stare. Although individuals who are impulsive may be at elevated risk for suicide (Dumais et al., 2005; Zouk, Tousignant, Seguin, Lesage, & Turecki, 2006), recent literature suggests that suicide itself is not an impulsive act (Anestis, Pennings, & Williams, 2014; Anestis, Soberay, Gutierrez, Hernández, & Joiner, 2014; Baca-García et al., 2001). One study found that individuals reporting past suicide attempts accompanied by a greater intent to die also endorsed greater levels of planning for the attempt (e.g., thinking about it for at least 1 year prior to the attempt; Anestis, Pennings, et al., 2014). Additionally, despite conflicting evidence regarding the precise role of alcohol prior to a suicide attempt, it seems that for some individuals, consumption of alcohol prior to an attempt may facilitate overcoming fear of death and self-harm, whereas for others, it may impair the ability to carry out a plan for suicide (Anestis, Joiner, Hanson, & Gutierrez, 2014). These findings support the notion that suicide attempts are often carried out after careful planning and pre-

meditation; therefore, they demand attention to execute, which in turn may lead to an unusually focused gaze.

In sum, given that suicide is an exceptionally fearsome act that necessitates planning, capability for lethal self-harm, and a significantly lowered fear of death, it follows that an individual who is intent on dying by suicide would demonstrate an unblinking, concentrated stare. This conjecture may have been alluded to over a half century ago by Hall (1945): “[Some eye blinks] are for the preservation of the organism as a whole, and are in no way concerned with the efficient action or protection of the eyes themselves” (p. 458). The absence of eye blinks, therefore, may indicate a derangement of self-preservation (cf. suicide).

Future Directions and Areas for Investigation

There are empirical and conceptual reasons to expect that a decreased eye blink rate may be associated with increased suicide risk; however, as previously mentioned, this relationship has yet to be systematically and empirically tested. Moving forward, research is needed to examine blink rates among individuals with varying severity of suicidal ideation and intent so as to explore whether a slowed blink rate is particularly notable among those at imminent and severe risk for suicide. For instance, it will be important to distinguish whether a low blink rate is an acute (i.e., an indicator of high intent to enact lethal self-harm in the immediate future) or a stable (i.e., an indicator of elevated but not necessarily imminent risk) marker of risk. Given individual differences in baseline blink rates, it may also be especially helpful to track at-risk individuals’ blink rates over time since changes in blink rate of a greater magnitude may be an indicator of a more significant increase in risk. As in the aforementioned study on blink rate and depression treatment (Mackintosh et al., 1983), changes in blink rate may also serve as an indicator of treatment progress and supplement self-report or clinician interview measures of treatment effectiveness. Additionally, work conducted to compare blink rates among suicidal individuals with nonsuicidal depressed patients, other nonsuicidal clinical populations, and healthy controls will be useful for assessing the clinical utility and specificity of this observable behavior.

Reflecting back on the anecdotes presented at the outset of this article, it is also possible that blink rate may be negatively correlated with degree of violence overall. For example, there may be a significant decrease in blink rate among individuals who are about to carry out murder-suicide or a lethal or near-lethal suicide attempt, and perhaps a slightly less noteworthy decrease in blink rate among individuals who are considering suicide. Similarly, changes in blink rate may be more apparent among individuals with the intent to use lethal or violent suicide means versus those who may plan to use less violent methods. Thus, research is warranted to specifically test and reveal whether such differences may exist.

Other parameters of blink rate deserve research scrutiny as well. Frequent partial blinks may convey risk, and the relationship of the “thousand-yard stare,” often associated with posttraumatic stress disorder, to blink rate and suicide risk is important to consider in future research.

Finally, it is important to keep in mind that eye blinking has the unique advantage of being an easily observable behavior that can be measured and recorded systematically. Should our conjectures hold up empirically, and eye blink rate show replicable and robust correlations with suicidality, it may represent a useful indicator of acute risk. Past research indicates that some individuals may not disclose their thoughts of suicide on self-report measures – roughly a third of suicide decedents reported on by Robins (1981) did not mention suicide to anyone before their deaths. Consequently, establishing objective indices of suicide risk is particularly important (e.g., Nock et al., 2010). Given the level of stigma, fear, and hesitation surrounding the disclosure of suicidal thoughts and behaviors, eye blink rate, as a behavioral marker of suicide risk, may prove to be an especially useful clinical tool for suicide risk assessment. Thus, it is our hope that research will help to illuminate answers to the questions raised in this piece, open up new avenues for research, and further efforts with regard to suicide risk assessment, prevention, and intervention.

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Suicide Attempt Characteristics Among Veterans and Active-Duty Service Members Receiving Mental Health Services: A Pooled Data Analysis

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Abstract

Past suicidal behaviors are among the strongest and most consistent predictors of eventual suicide and may be particularly salient in military suicide. The current study compared characteristics of suicide attempts in veterans ($N = 746$) and active-duty service members ($N = 1,013$) receiving treatment for acute suicide risk. Baseline data from six randomized controlled trials were pooled and analyzed using robust regression. Service members had greater odds of having attempted suicide relative to veterans, though there were no differences in number of attempts made. Service members also had higher rates of premilitary suicide attempts and nonsuicidal self-injury (NSSI). Veterans disproportionately attempted suicide by means of overdose. In veterans, combat deployment was associated with lower odds of lifetime suicide attempt, while history of NSSI was associated with greater attempt odds. Neither was significantly associated with lifetime suicide attempt in service members. Implications for suicide assessment and treatment are discussed.

Thousands of studies have been conducted over the past 40-plus years attempting to characterize suicide risk and protective factors in an effort to improve prevention efforts. The bulk of this research both in the United States and internationally has involved civilian

participants. That may be partly due to the fact that, until recently, serving in the military appeared to be protective against suicide (Berman et al., 2010; Nock et al., 2014). Historically, suicide rates among U.S. service members were roughly half those of their civilian counterparts (Eaton, Messer, Garvey Wilson, & Hoge, 2006; Kessler et al., 2013), but the military suicide rate has been climbing. In 2008 the rate of suicide in Army personnel exceeded that of demographically matched civilians for the first time (Kuehn, 2009; Nock et al., 2014). Suicide rates among U.S. veterans are also higher and climbing faster than in the U.S. general population, and this trend may be worse among women. Between 2001 and 2010 male veteran suicides increased by 15%, while suicide among female veterans increased by 35% (Kemp & Bossarte, 2013).

Preventing military suicide is a top priority, and together the U.S. Departments of Defense (DoD) and Veterans Affairs (VA) fund almost one-quarter of all U.S. suicide studies, accounting for 53% of federal dollars spent on suicide research (NAASP, 2015). The DoD has focused efforts on suicide surveillance using the DoD Suicide Event Report (DoDSER) system, an event-based epidemiological data collection system developed to examine the circumstances of suicide behaviors among service members (Bush et al., 2013). The VA is also improving suicide surveillance by integrating information from the National Death Index, state mortality records, Suicide Behavior Reports, Veterans Crisis Line, and the VA's universal electronic medical records (Kemp & Bossarte, 2013).

The military has also bolstered efforts to understand characteristics of suicidal behavior among military personnel to better identify those at risk and improve suicide prevention efforts. Large epidemiological studies like the Millennium Cohort Study (Gray et al., 2002) and Army Study to Assess Risk and Resilience in Servicemembers (Army STARRS; Ursano et al., 2014) are in progress and have begun to elucidate the problem of military suicide at the population level. Thus far, military variables (e.g., combat deployment and associated stressors) have shown low associations with suicidal ideation and behaviors (Bryan et al., 2015; Griffith, 2012). A number of suicide risk factors have been identified from these studies (Nock et al., 2013), but many are not unique to military suicide (e.g., presence of mental illness, stressful life events, hopelessness) or are so characteristic of the military that they have minimal use in detecting risk (e.g., men, ages 17 to 29, access to lethal means). Relatively few studies have examined the role of historical variables that elevate suicide risk, despite evidence that these confer greater risk for suicidal thoughts and behaviors among service members and veterans (Bryan, Bryan, Ray-Sannerud, Etienne, & Morrow, 2014; Griffith, 2012).

Past suicidal behaviors are among the strongest and most consistent predictors of eventual suicide, and previous attempts are associated with more severe suicidal ideation among service members (Joiner et al., 2005). An understanding of how and when previous suicide attempts occurred could lead to more effective strategies for identifying and treating service members and veterans who are most vulnerable to suicidal thoughts and behaviors (Bryan et al., 2014). While there is extensive research comparing self-injurious thoughts and behaviors among military personnel to the general population, data directly comparing suicide behaviors in active-duty service members and veterans are scant (see Bossarte et al., 2012). Additional research is needed to understand characteristics of suicide that are specific to

service members and to veterans, because assessment and intervention strategies for these two groups are implemented in different health care systems. It is not known whether or how suicide characteristics differ, or if intervention strategies based on such knowledge will generalize across the Military Health System (MHS) and Veterans Health Administration (VHA).

The current study sought to characterize nonfatal suicide attempts in a sample of 1,759 service members and veterans across the armed services receiving treatment at either MHS or VHA clinics due to concerns about suicide risk. We sought to answer three primary research questions. First, what proportion of active-duty service members versus veterans in suicide-related treatment has ever attempted suicide? Second, do timing, method, and lethality of nonfatal suicide attempts differ between service members and veterans? And finally, are there differences between service members and veterans in terms of demographic and military variables associated with attempted suicide?

METHOD

Sample of Studies

This report presents an analysis of pooled baseline data from six randomized controlled trials examining suicide interventions in active-duty and veteran military personnel. Data were collected between 2010 and 2015. The primary inclusion criteria across four studies (Bryan, 2013; Comtois, 2013; Jobes, 2011; Johnson, O'Connor, Kaminer, Jobes, & Gutierrez, 2014) were current suicidal ideation and/or a lifetime suicide attempt. Two studies (Gutierrez, 2009; Luxton, 2011) did not recruit based on suicidality but on recent discharge from inpatient psychiatric hospitalization, outpatient mental health, or substance abuse treatment. For these studies, we selected only participants with a lifetime suicide attempt and/or current suicidal ideation for inclusion in the pooled data analyses. Common exclusion criteria across studies were inability to speak and understand English, psychiatric or medical condition severe enough to preclude consent, and judicially ordered or involuntary treatment. Detailed descriptions of sample characteristics can be found in the introduction to the upcoming issue's special section (Gutierrez, in press). All studies were approved by appropriate military, VA, and university institutional review boards (IRBs) prior to enrollment, and all relevant IRBs approved pooling of data for the purposes of secondary data analyses. Deidentified, individual, item-level data were pooled into a single data set containing 1,759 cases.

Instruments

The current analyses examined demographic (i.e., sex, race, ethnicity), military (i.e., service branch, combat deployment, military service years), and nonsuicidal self-injury (NSSI) variables as correlates of nonfatal suicide attempt in service members and veterans. Prevalence and characteristics of suicide attempt (i.e., premilitary, during active service, following separation, method of injury) were assessed via two standardized clinical interviews. The Suicide Attempt and Self-Injury Count (Linehan, Comtois, Brown, Heard, & Wagner, 2006) is a semistructured interview that assesses lifetime acts of self-directed violence, method of injury, suicide intent, lethality of attempt, and medical treatment

received. It has demonstrated excellent interrater reliability (ICCs .871 to .978) and validity compared to medical records, therapist notes, and patient self-monitoring. The Self-Harm Behavior Questionnaire (SHBQ; Gutierrez, Osman, Barrios, & Kopper, 2001) is a semistructured interview that assesses lifetime instances of self-directed violence, suicidal intent, suicide threats, and suicide ideation, as well as method of injury and need for medical attention. Good internal consistency ($.96 > \alpha > .89$) was demonstrated in the original validation study. In the current study, suicide attempt was defined as an act of self-directed violence with either clear or ambivalent intent to die. Acts of self-directed violence with no intent to die were categorized as NSSI.

A subset of the sample ($n = 887$) was assessed for lethality per instance of attempted suicide. Lethality was rated using a behaviorally anchored rating scale indicating medical risk of death, with minimum value of 1 (e.g., ingesting 5 or fewer pills of a medication not lethal in small doses) and maximum value of 6 (e.g., pulling trigger of loaded gun aimed at vital area).

Data Analysis

Logistic regression was used to compare the odds of having a lifetime suicide attempt, premilitary suicide attempt, and suicide attempt by various methods of self-directed violence among veterans and service members receiving suicide-related treatment. Since the modal number of suicide attempts was zero, a negative binomial regression was used to model number of suicide attempts. Multivariate logistic regression was used to compare demographic, military, and clinical correlates of lifetime suicide attempt among veterans and service members. We applied a Bonferroni correction for inflated family-wise error in this final model due to the seven separate interaction terms included in the analysis. All regression models accounted for effects of sex, race, and ethnicity and employed robust standard error estimators that are consistent under heteroscedasticity. Though data were drawn from six different study samples, we assumed that all sampled from the population of interest (i.e., veterans and service members receiving suicide-related treatment); therefore, a nested design was not employed.

Results

Table 1 reports participant demographic and military characteristics. Descriptive suicide behavior data is reported in Table 2.

History of suicide attempt—Approximately half of all participants reported at least one suicide attempt in their lifetimes. Service members had a 24% greater odds of having attempted suicide than veterans (OR = 1.24, 95% CI: 1.02, 1.51), accounting for the effects of sex, race, and ethnicity. No other variables in the model were significantly related to having made a lifetime suicide attempt. Among those who attempted suicide, veterans made a greater number of attempts per individual, but this difference was not statistically significant in negative binomial regression analysis.

Timing of first suicide attempt—The majority of first attempts by veterans typically occurred after military separation, with only 22% occurring prior to military enrollment and

21% occurring during active service. The majority of first attempts among service members occurred during active service, though 40% reported a premilitary suicide attempt. The odds of having attempted suicide prior to joining the military were 51% greater for service members relative to veterans (OR = 1.51, 95% CI: 1.10, 2.06) when accounting for effects of sex, race, and ethnicity. Sex was an independent predictor of premilitary suicide; the odds of having attempted suicide prior to joining the military were two times greater for women than for men (OR = 2.15, 95% CI: 1.56, 2.97).

Method of suicide attempt—Figure 1 represents the relative odds of having used specific suicide attempt methods by veterans and service members. Relative to veterans, service members had greater odds of self-cutting (OR = 2.13, 95% CI: 1.65, 2.76), burning (OR = 1.94, 95% CI: 1.24, 3.02), hanging or strangling (OR = 1.70, 95% CI: 1.19, 2.44), headbanging or hitting themselves with an object (OR = 1.55, 95% CI: 1.08, 2.22), or some other less common method of attempting suicide (OR = .673, 95% CI: .460, .985). The odds of intentionally overdosing on drugs, medicine, or alcohol were 47% greater for veterans than for active-duty service members (OR = .525, 95% CI: .409, .673). No significant differences were observed between veterans and service members in probability of attempting suicide by jumping from a height, gunshot, poisoning, asphyxiation or strangling, attempted drowning, or stabbing.

Sex was an independent predictor of engaging in certain methods of suicide attempt. Women in this sample had greater odds of attempt by cutting (OR = 1.72, 95% CI: 1.28, 2.31) and overdosing (OR = 2.17, 95% CI: 1.62, 2.90) relative to men. Men had greater odds of hanging or strangling (OR = .563, 95% CI: .360, .880), gunshot (OR = .389, 95% CI: .171, .887), or some less common method of attempting suicide (OR = .673, 95% CI: .460, .985).

Some racial or ethnic minority groups had significantly different odds of engaging in certain suicide attempt methods relative to Caucasians. African Americans had lower odds of self-cutting (OR = .479, 95% CI: .328, .701) or stabbing (OR = .174, 95% CI: .042, .718) but greater odds of self-poisoning (OR = 2.59, 95% CI: 1.23, 5.45). Participants with mixed racial identities had greater odds of jumping from a height (OR = 3.05, 95% CI: 1.38, 6.78) and headbanging (OR = 1.73, 95% CI: 1.00, 2.99). American Indians/Alaskan Natives had greater odds of self-poisoning (OR = 12.19, 95% CI: 3.61, 41.22). Participants reporting Hispanic ethnicity had greater odds of overdosing (OR = 1.43, 95% CI: 1.02, 2.02) and lower odds of self-stabbing (OR = .284, 95% CI: .087, .931) than non-Hispanics.

Lethality of suicide attempts—Across the subsample for which it was available, suicide attempt lethality spanned the full range of possible values and was normally distributed ($M = 3.47$, $SD = 1.5$). Veterans were more likely than service members to engage in more lethal suicide attempts ($B = -.303$, 95% CI: $-.516$, $-.090$) when accounting for effects of sex, race, and ethnicity. Men, regardless of active or veteran status, were more likely to engage in more lethal attempts than women ($B = -2.53$, 95% CI: $-.475$, $-.030$). Race and ethnicity were not significantly associated with lethality of suicide attempts.

Factors associated with suicide attempt—Multiple regression analysis revealed no main effects for demographic or military variables associated with lifetime suicide attempt, but two significant interactions were observed. A summary of these results can be seen in Table 3. Veterans who had been deployed to combat had significantly lower odds of having attempted suicide relative to veterans with no combat deployments. Service members deployed to combat had slightly greater odds of suicide attempt relative to service members who had not been deployed, but this relationship was not statistically significant. A significant interaction was also observed between service status and lifetime history of NSSI predicting attempt odds. Among service members, odds of having made a suicide attempt were not significantly affected by having engaged in NSSI. In contrast, the odds of a suicide attempt were 3.6 times higher for veterans who had a history of NSSI relative to veterans who did not.

DISCUSSION

Suicide ideation, planning, and behavior are robust risk factors for suicide death and often precipitate mental health service connection for service members and veterans. Thus, understanding characteristics of attempted suicide can be an effective step toward improving the assessment and treatment of suicidality in these groups. The current study sought to understand the context and characteristics of non-fatal suicide attempts in a pooled sample of 1,759 service members and veterans enrolled in suicide intervention studies within the DoD and VA. In so doing, we hope to highlight similarities and differences between the two groups and potentially spark ideas for researchers, clinicians, and policymakers addressing the significant public health problem of service member and veteran suicide.

Veterans and Service Members Differed in Nonfatal Suicide Attempt Characteristics

The proportion of service members and veterans in treatment for suicide risk that report a nonfatal suicide attempt does not appear strikingly different (51% and 46%, respectively), but service members had 24% greater odds of having attempted suicide. When interpreting these findings, it is important to remember that service members and veterans who died by suicide are not represented in this study. This may partially explain the finding that the average number of lifetime attempts was equivalent between service members and veterans, even though veterans had more years of lived experience and thus more opportunity to attempt and complete suicide. It is possible that the veterans who survived and made it into the source studies were more resilient or had more successful interventions over the years and therefore were less likely to have attempted suicide in spite of suicidal distress. Another possible explanation is that the nature of military service has changed such that current service members are at increased risk of attempting suicide (Nock et al., 2014; Schoenbaum et al., 2014), whereas veterans of previous periods of service benefited from the generally protective nature of military service (Gallaway et al., 2013). Longitudinal research into the situational risk factors associated with military service and retirement, and how they change over time, is recommended.

Timing of first attempt—The majority of first attempts among veterans occurred after military separation, while most first attempts among service members occurred during

military service, even though the active service period is not yet complete in this group. Servicemembers also had 51% greater odds of attempting suicide prior to military enrollment. This finding is particularly concerning in light of recent evidence that premilitary suicide attempts remain a significant predictor of later suicide attempts in service members and veterans, even when controlling for the effects of demographic variables, psychological distress, suicide plans, and NSSI (Bryan et al., 2014). Though the rate of premilitary suicide attempt observed in this study is considerably higher than in recent reports of prevalence in new soldiers (Ursano et al., 2015), as well as in military personnel receiving outpatient mental health treatment, it is consistent with the latter study's estimates that at least half of service members and veterans who engage in suicidal behaviors have a history of premilitary suicide ideation or self-directed violence (Bryan et al., 2014).

Methods of nonfatal suicide attempt—Veterans had 47% greater odds than service members of attempting suicide by overdosing on medications, drugs, or alcohol. It is possible that veterans more often selected some means of overdose due to easier access to prescription medications, alcohol, and illicit drugs than active-duty service members, though additional factors likely play a role. For example, veterans are more likely to have chronic pain and long-term health conditions requiring polypharmacy (Im et al., 2015), conferring both additional suicide risk and increased access to suicide means. Veterans are also more likely to be socially isolated and use alcohol and drugs in contexts where an overdose may not be detected (Dittrich et al., 2015). Illicit drugs and alcohol might be used very socially in the military setting, and service members may have fewer opportunities to overdose without being discovered by others. Those who wish to die may choose a “quicker” means with less likelihood of being interrupted.

Though firearms are the most common means of suicide in the United States (Xu, Kochanek, Murphy, & Arias, 2014), including among service members and veterans, this highly lethal method is naturally less common in a sample of suicide attempt survivors. Service members had greater odds of using suicide methods associated with both greater (e.g., hanging, burning, or immolation) and lesser risk of death (e.g., cutting, headbanging). Some level of suicide intent was recorded in each of these instances, so this finding may reflect greater ambivalence about wanting to die. The disproportionate number of nonfatal suicide attempts using relatively lethal means may also indicate a greater likelihood of service members being interrupted during a suicide attempt. This hypothesis is consistent with the 2013 DoDSER report that 40% of service member suicide attempts were observable to others and 71% occurred at the service member's permanent duty station (Smolenski et al., 2014).

The observed gender differences in methods of nonfatal suicide attempt are in keeping with general population findings, where men tend to select more violent means (Andover, Primack, Gibb, & Pepper, 2010; Brown, Comtois, & Linehan, 2002). However, it is important to note that rates of firearm suicide increased disproportionately among female veterans from 2001 to 2010, which may point to an important change in preference for more lethal means that deserves further study (McCarten, Hoffmire, & Bossarte, 2015). We do not know enough from the extant literature about racial and ethnic differences in suicide attempt methods (Eaton et al., 2006) to determine whether our findings are consistent with what is

seen in civilians. Though the very large odds of American Indian/Alaskan Native (AI/ AN) participants self-poisoning is striking, this result should be interpreted with caution, because poisoning was a rare event and those identifying as AI/AN represented only 4% of the total sample.

Lethality—The violence associated with a chosen means does not necessarily line up with the lethality of a suicide attempt, which is also influenced by situational factors that contribute to risk of fatality. Veterans had significantly greater odds of making a more lethal suicide attempt than service members. This was partially due to the increased likelihood of attempting suicide while intoxicated, which confers greater medical risk of death, and low potential for being interrupted. Age may also be a factor in the higher lethality observed among veterans. Generally speaking, as people get older and gain more experience with self-directed violence they select methods with greater potential lethality (Alexopoulos et al., 2009; Bhar & Brown, 2012; Eddleston, Dissanayake, Sheriff, Warrell, & Gunnel, 2006). As Joiner's (2005) interpersonal psychological theory proposes, the capability for suicide is acquired through repeated exposure to painful and life-threatening experiences, and it takes time for people to habituate to the pain associated with increasingly lethal self-injury. So it is possible that the active-duty participants have yet to develop high enough levels of acquired capability to engage in more lethal self-directed violence. Our finding does not support more recent theorizing about the primary role of acquired suicide in military suicide (Selby et al., 2010), but the current study was not specifically designed to test Joiner's (2005) theory, so we offer this interpretation tentatively and recommend additional research.

Factors Associated With Suicide Differed Among Service Members and Veterans

It is well established in the literature that NSSI confers significant risk of suicide for soldiers (Nock et al., 2013), veterans (Bryan et al., 2014), and civilians (Joiner, Ribeiro, & Silva, 2012). However, a surprising interaction between service status, NSSI, and suicide attempt was observed in this study. Consistent with existing literature, veterans with a lifetime history of NSSI were significantly more likely to have made a suicide attempt than those with no instances of NSSI. In contrast, NSSI was not associated with suicide attempt among service members, even though the proportion of service members who had engaged in NSSI was twice the proportion observed in veterans. It is possible that the greater incidence of NSSI in service members reflects a generational shift in the prevalence and function of NSSI (Klonsky, 2011), diluting its historical association with suicide attempt. It is also possible that veterans had more years to acquire suicide capability through repeated instances of NSSI than the typically younger service members. We cannot make inferences about causality because the nature of our data does not allow for testing the temporal sequence of events. However, these results highlight the need for prospective, longitudinal research to better understand the interaction between military service, NSSI, and suicide attempts.

Much has been made in the popular press about the likely connections between combat deployments and suicide risk, with the assumption being that combat deployment increases the risk for suicide. However, the scientific literature has yet to demonstrate clear evidence of this relationship. The Millennium Cohort Study, a prospective epidemiological study with more than 200,000 randomly selected U.S. military service members from all service

branches, found no evidence that deployment was associated with suicide and that those deployed to the current operations were no more likely to have a suicide death than those who did not deploy (LeardMann et al., 2013). A recent study looking specifically at those serving in Operation Enduring Freedom or Operation Iraqi Freedom also did not find an association between deployment and rates of suicide (Reger et al., 2015). Whereas findings from an epidemiological study focusing on the U.S. Army found an association between deployment and risk of suicide attempt (Nock et al., 2014) and suicide (Schoenbaum et al., 2014). In our pooled sample, active combat deployment was associated with slightly increased odds of a lifetime suicide attempt in service members, though this finding was not statistically significant. However, a history of combat deployment was associated with significantly *lower* odds of having attempted suicide among veterans. It is possible that combat deployment in previous conflicts may be linked to the historically protective effect of military service on suicide. It is also possible that veterans who have survived suicidal thoughts and behaviors, like those in this study, are impacted differently by combat deployment than veterans who have died by suicide. Further research is needed to understand the complex relationship between combat deployment and suicidal behaviors in veterans, as existing data are inconclusive.

Clinical Implications and Suggestions for Further Research

Epidemiological studies consistently find history of suicidal behavior to be one of the strongest risk factors for eventual death by suicide (Borges et al., 2006; Borges et al., 2010), and yet it is widely accepted that nonfatal suicide attempts are substantially underreported (Crosby, Han, Ortega, Parks, & Gfroerer, 2011). This means that one of the best ways to identify those at risk and intervene prior to a suicidal crisis has limited utility as a screening and prevention tool. This problem is reflected in our finding that over half of the service members and veterans in our sample attempted suicide and many of those attempts occurred prior to or during military service. Underreporting may be more prevalent in active duty service members, because past suicidal behavior is a disqualifying condition for military enrollment and many service members fear that disclosure will negatively impact their military careers (e.g., security clearance). This is supported by our finding that 34% of service members reported a history of NSSI and 51% reported a previous suicide attempt, while prior self-injury is reported in only 28% of suicide attempts and 10% suicide deaths in the 2013 DoD SER annual report (Smolenski et al., 2014). Clinicians, commanding officers, and policymakers need to work in concert so that acknowledgment and treatment of suicidal thoughts and behaviors become an accepted, effective solution that meets the needs of both the military and its current and former personnel.

Our finding that service members have disproportionately higher incidence of premilitary suicide attempts has important implications for clinicians assessing and treating military personnel. When assessing suicide risk, historical and dispositional factors are often overlooked in the presence of strong situational factors associated with suicide, as is often the case for military personnel. We recommend clinicians assume that suicidal service members have premilitary vulnerabilities that confer substantial risk for suicide and be attentive to the context and characteristics of possible past suicidal behaviors, as these factors may confer greater risk among military personnel. Given the understandable

reluctance of service members to report previous suicidal behavior, clinicians are encouraged to use strategies that are collaborative (Jobes, 2006) and validating (Rizvi, 2011) to normalize preexisting vulnerabilities and frame them as useful information in developing effective and personalized prevention and treatment plans. We encourage future research to examine the causes and context of underreporting past and present suicidality that may be specific to the military to adapt screening and prevention procedures and maximize the predictive utility of this robust risk factor.

The disproportionate number of service members with a history of NSSI and suicide attempts with minimal potential for lethality suggests there may be complex motivations and ambivalent suicidal intent in this population. Assessment of suicidal ambivalence (i.e., both the wish to die and the wish to live) has successfully predicted future suicidal thoughts and behaviors, response to suicide treatment, and eventual suicide (O'Connor, Jobes, Yeargin, et al., 2012; Brown, Steer, Henriques, & Beck, 2005; O'Connor, Jobes, Comtois, et al., 2012; Lento, Ellis, Hinnant, & Jobes, 2013). We recommend that clinicians assess both reasons to live and reasons to die when calculating suicide risk and throughout treatment in order to monitor progress. The ambivalence rating used in the studies noted here can be easily calculated from the Suicide Status Form used in the evidence-based Collaborative Assessment and Management of Suicide (Jobes, 2006).

Several of the current findings are of interest to clinicians treating veterans with suicidal thoughts and behaviors. Veterans disproportionately attempted suicide by means of intentional overdose and generally made more lethal attempts than service members. Means safety is one of the most effective suicide prevention measures (Yip et al., 2012), though previous research has typically focused on limiting access to firearms. Clinicians are advised to also assess prescription medications, alcohol, and recreational drugs as a potential means of suicide in veterans. Motivational interviewing shows promise in means safety counseling (Britton, Bryan, & Valenstein, 2014), and clinical trials are currently taking place within the VA. Medication blister packs are another promising tool for reducing the likelihood of intentional overdose (Hawton et al., 2004), and one of our source studies is evaluating their use in the VA (Gutierrez, 2009). Because contextual factors contribute to the lethality of suicide attempts, clinicians are also advised to assess factors that influence the likelihood of being interrupted by others (e.g., social isolation) or being capable of intervening on one's own behalf (e.g., intoxication interfering with help seeking).

While the number of previous suicide attempts in this sample is concerning, the fact that 1,759 service members and veterans survived suicidal distress and found their way to suicide treatment is notable. This raises hope that identification and treatment of suicidality in the DoD and VA may increase longevity even if suicidal thoughts and behaviors reoccur. This last point is particularly salient because the unique nature of the military experience typically contributes to elevations in suicide risk, such as overcoming fear of lethal injury, that persist even in the absence of situational risk factors, including those associated with combat deployment and transition to civilian life (Selby et al., 2010). The DoD and VA may be ideal contexts for preventing suicide at a population level. The DoD is uniquely poised to detect suicide risk, due to its rigorous suicide surveillance, the number of persons with dispositional and historical risk factors who join the military, and the situational risk factors

inherent to the military experience (e.g., access to firearms, acquired capability due to repeated exposure to life-threatening events). Likewise, the VA has the capability to implement evidence-based suicide treatment to a large proportion of Americans at risk for suicide. The VHA is the largest health care system in the country, serving 8.76 million veterans per year at more than 1,700 health care sites, and is the largest employer of psychologists and social workers in the country (<http://www.va.gov/health>).

Correlational data suggest recent VA initiatives to reduce mental health stigma, increase health service engagement, and implement evidence-based behavioral health interventions across the VHA system may be having a positive impact on suicidal thoughts and behaviors among veterans. During the period from 1999 to 2010, veterans under age 40 using VHA services had half the suicide rate of those who did not (Kemp, 2014). The protective effect of VHA service utilization is particularly salient for male veterans. In 23 states where data are available to allow comparisons, suicide rates decreased by about 30% in male veteran VHA users, while they increased by about 60% in male veterans who did not use VHA services (Kemp, 2014). Unfortunately, it is estimated that 10% of nonelderly veterans in the United States do not have health insurance and do not use VHA services (Haley & Kenney, 2012). Service members and veterans must access health services for these suicide prevention strategies to work. In addition to clinical trials, we recommend research to improve health service engagement and continuity among U.S. service members and veterans.

A number of promising suicide prevention and treatment interventions have been developed and are currently being evaluated in clinical trials at VA and military installations across the country, including the six source studies used in the current analysis. While targeted treatment is most effective in changing suicidal thoughts and behaviors (Comtois & Linehan, 2006), evidence is mounting that VA implementation of evidence-based psychotherapies for related problems (e.g., depression, sleep disorders) has a positive impact on suicidal ideation. In an analysis of 981 veterans who received acceptance and commitment therapy for depression (ACT-D; Walser, Sears, Chartier, & Karlin, in press) in the VA, a 20.5% reduction in suicide ideation was observed from baseline to follow-up (Walser et al., 2015). Though ACT-D is not specifically a suicide intervention, it does target psychological processes that are theoretically and empirically linked to suicide (Luoma & Villatte, 2012). In the VA rollout of ACT-D, changes in these processes were associated with reductions in suicidal ideation and depression severity and their attenuating effect increased over time (Walser et al., in press). Similarly, a 10% reduction in suicidal ideation from baseline to follow-up was reported in an evaluation of the VA rollout of cognitive behavioral therapy for insomnia (CBT-I; Trockel, Karlin, Taylor, Brown & Manber, 2015).

Study Strengths and Limitations

Data about suicide and individuals affected by suicide are notoriously difficult to obtain for a variety of reasons, including a relatively low incidence rate and reluctance to acknowledge suicidal thoughts, behaviors, and intent (Crosby, Han, et al., 2011). Thus, it is imperative that researchers maximize the use of data from existing studies to strengthen the public health impact of suicide research. The National Action Alliance for Suicide Prevention

(NAASP) (2014) and the National Institute of Mental Health (NIMH) (2015) have both prioritized this objective in their most recent strategic research plans. Two recommended strategies for leveraging suicide research investments (i.e., data sharing and the use of common data elements) were employed in the current study to obtain maximum benefit from the large pooled sample and rigorous, comprehensive baseline assessments in six federally funded suicide randomized controlled trials (RCTs).

However, this is not a true epidemiological study, and the results cannot be interpreted as incidence or prevalence rates because participants are not representative of the entire population of U.S. service members and veterans. Due to the design and intent of the original studies (i.e., RCTs of military suicide interventions), three important groups were necessarily omitted from our sample: those who never reported or received treatment for suicidality in the MHS or VHA, separated military personnel not eligible for VA benefits, and those who died by suicide. Data from these groups are essential to understanding military suicide at a population level and, fortunately, the Millennium Cohort Study and other large-scale epidemiological studies are designed to do just that. However, their exclusion leaves us with a subgroup that is important to study in its own right: service members and veterans who are treated for suicide risk in the MHS and VHA. Findings from this study are relevant to suicide assessment and treatment decisions made by health care providers and administrators, researchers, and policymakers in the DoD and VA.

Almost all active-duty service members receive health services through the MHS, but only 25% of veterans receive their health care through the VHA (National Center for Veterans Analysis and Statistics [NCVAS], 2014), raising the question of whether current results may generalize to veterans not receiving VHA services. Some data suggest they would. Veterans with VHA services have similar suicide rates to the general population of veterans, and suicide outcomes in these two groups are more similar to each other than they are to civilians (NCVAS, 2014).

As with all pooled data analyses, including meta-analyses, generalizability of results is complicated by sampling and instrument heterogeneity. Two of the participating studies (Gutierrez, 2009; Luxton, 2011) used selection criteria that differed from the other four but included baseline measures that allowed us to select a subsample of participants using equivalent inclusion and exclusion criteria across all six studies. We believe it is reasonable to assume, based on the combined sampling procedures from the original and pooled data studies, that the current sample is representative of service members and veterans who receive treatment for suicidal thoughts and/or behaviors in the MHS and VHA systems. Fortunately, most of the participating studies included the common data elements recommended for suicide research (Crosby, Ortega, & Melanson, 2011), so instrument harmonization was required in only one instance. One study (Gutierrez, 2009) used a different measure of suicidal behavior, which has similar psycho-metric properties to the common measure, uses the same measure modality (i.e., semistructured interview), and obtains unprocessed behavior count data that are equivalent to the other studies.

The most significant limitations of this study are the potential confounds inherent to our variables of interest. Veterans are a relatively more heterogeneous group in terms of age and

conflict era than are active service members. Few of the veterans in this study were deployed in recent conflicts, while none of the service members served during the Vietnam or prior conflicts. All of these veterans have transitioned back to living as civilians, while service members have not yet experienced life after military separation. It is not possible to determine whether observed effects are due to service member or veteran status or to variables that cannot be separated from service status, such as age/developmental factors, generational differences, factors specific to current conflicts, and situational factors unique to the military or veteran experience (e.g., deployment conditions, transition to civilian life). Yet we believe there is practical value in examining similarities and differences in these groups. If the characteristics and circumstances of attempted suicide are different in service members and veterans who present to MHS and VHA clinics, assessment and treatment strategies should and can be adjusted accordingly, even if the causes of these differences are not known.

Conclusion

Suicide prevention is complex and multifaceted. It requires good assessment strategies that capture accurate data on risk and protective factors, skilled clinicians able to focus directly on suicide as the problem to be treated, and policies informed by the best available empirical data. We hope our characterization of suicide attempts in active-duty service members and veterans provides some insights on which clinicians, policy-makers, and researchers can build, and contributes to a culture where participation in suicide treatment among current and former military personnel is considered as a mark of resilience, selflessness, and courage.

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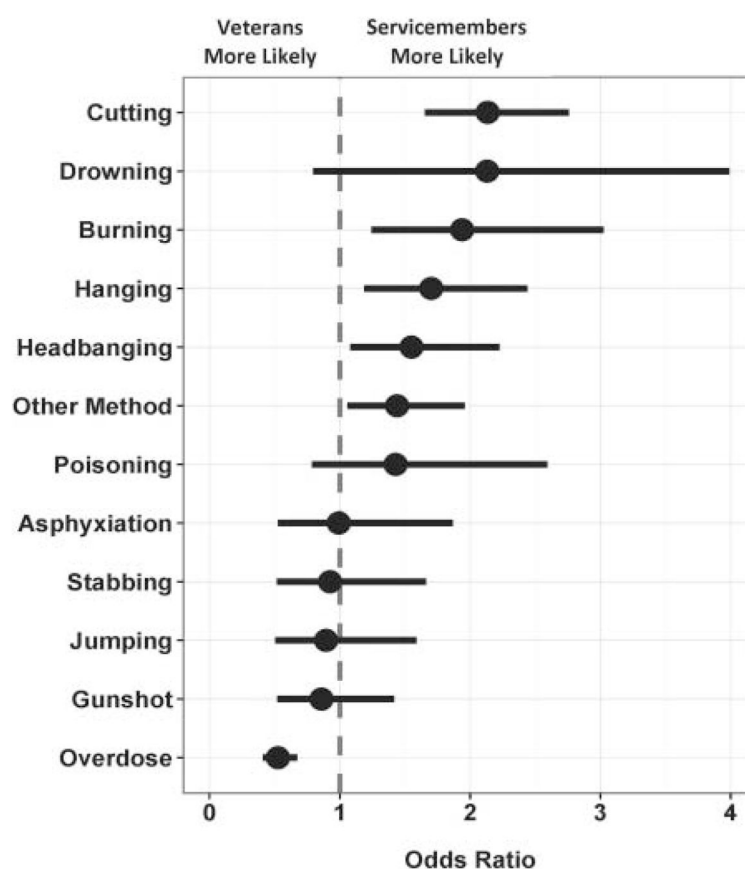


Figure 1.

Relative odds of suicide attempt methods used by veterans and service members

Note. The points represent the odds ratio for each method, with the dashed line at 1.0 indicating no difference between veterans and service members. A dot on the left side of the dashed line indicates Veterans had greater odds of using a method, while a dot on the right side means service members had greater odds. The horizontal line around the point represents the 95% confidence interval and if it does not cross the dashed line, the difference is statistically significant.

TABLE 1**Participant Demographic and Military Characteristics**

Variable	Service Members (N = 1,013)	Veterans (N = 746)	Total (N = 1,759)
Female	271 (27%)	86 (12%)	357 (20%)
Race and ethnicity			
Caucasian	726 (72%)	496 (67%)	1222 (70%)
African American	129 (13%)	133 (18%)	262 (15%)
Mixed race	89 (9%)	41 (6%)	130 (7%)
Asian American/Pacific Islander	7 (1%)	13 (2%)	20 (1%)
American Indian/Alaska Native	45 (4%)	26 (4%)	71 (4%)
Hispanic	188 (19%)	78 (11%)	266 (15%)
Service branch			
Army	642 (63%)	403 (54%)	1045 (60%)
Marines	157 (16%)	106 (14%)	263 (15%)
Navy	173 (17%)	149 (20%)	322 (18%)
Air Force	41 (4%)	88 (12%)	129 (7%)
Mean years of military service	4.76 (4.57)	5.62 (4.89)	5.13 (4.72)
Combat deployment	477 (47%)	297 (40%)	744 (44%)

TABLE 2

Proportions of Suicide Behaviors in Service Members and Veterans in Treatment for Suicide Risk

Variable	Service Members(N = 1,013)	Veterans(N = 746)	Total Sample(N = 1,759)
Lifetime nonsuicidal self-injury	341 (34%)	126 (17%)	467 (27%)
Lifetime suicide attempt	519 (51%)	342 (46%)	861 (49%)
Among suicide attempt survivors			
Number of attempts	2.57 (19.4)	2.96 (25.3)	2.74 (22.1)
Premilitary attempt	207 (40%)	76 (22%)	276 (32%)
Active-duty attempt	310 (60%)	72 (21%)	362 (42%)
Veteran attempt	—	195 (57%)	—
Maximum lethality	3.35 (1.54)	3.71 (1.48)	3.47 (1.53)
Method of suicide attempt			
Cutting	298 (29%)	150 (20%)	448 (26%)
Drowning	16 (2%)	7 (1%)	23 (1%)
Burning	72 (7%)	37 (5%)	109 (6%)
Hanging/strangling	114 (11%)	66 (9%)	180 (10%)
Headbanging/hitting with object	106 (11%)	63 (8%)	169 (10%)
Poisoning	28 (3%)	21 (3%)	49 (3%)
Asphyxiation/smothering	22 (2%)	21 (3%)	43 (2%)
Stabbing/puncturing	30 (3%)	25 (3%)	55 (3%)
Jumping from a height	31 (3%)	28 (4%)	59 (3%)
Gunshot	34 (3%)	37 (5%)	71 (4%)
Drug or medication overdose	256 (25%)	292 (39%)	548 (31%)
Other method	139 (14%)	97 (13%)	236 (13%)

^aMean (standard deviation).

Summary of Regression Analysis Testing Interaction Effects of Military Service Status and Correlates of Lifetime Suicide Attempt

TABLE 3

Variable	Odds Ratio	Robust Standard Error	95% CI Lower	Upper	p
Active duty × Female	0.75	0.23	0.41	1.36	0.34
Active duty × Race					
African American	0.93	0.28	0.52	1.66	0.80
Mixed race	0.88	0.37	0.38	2.00	0.75
Asian American/Pacific Islander	1.95	1.19	0.58	6.48	0.28
American Indian/Alaska Native	1.65	1.77	0.20	13.49	0.64
Active duty × Hispanic ethnicity	0.55	0.17	0.30	1.01	0.05
Active duty × Military branch					
Marines	0.82	0.26	0.45	1.51	0.52
Navy	0.56	0.16	0.33	0.97	0.04
Air Force	1.12	0.49	0.48	2.65	0.79
Active duty × Service years	0.96	0.03	0.91	1.01	0.13
Active duty × Combat deployed	1.90	0.44	1.20	3.01	.006*
Active duty × Nonsuicidal self-injury	0.33	0.09	0.20	0.55	< .001*

Note. The largest category in the sample was selected as the comparison group in all interaction analyses with categorical variables.

^a Caucasian was used as the comparison group for service status × race analyses.

^b Army was used as the comparison group for service status × military branch analyses.

* Statistically significant with Bonferroni correction ($p < .007$).

Military Suicide Research Consortium (MSRC)

09162006; 10274002

W81XWH-10-2-0178; W81XWH-10-2-0181

PIs: Peter M. Gutierrez, Ph.D. & Thomas Joiner, Ph.D.

Org: Denver Research Institute & Florida State University



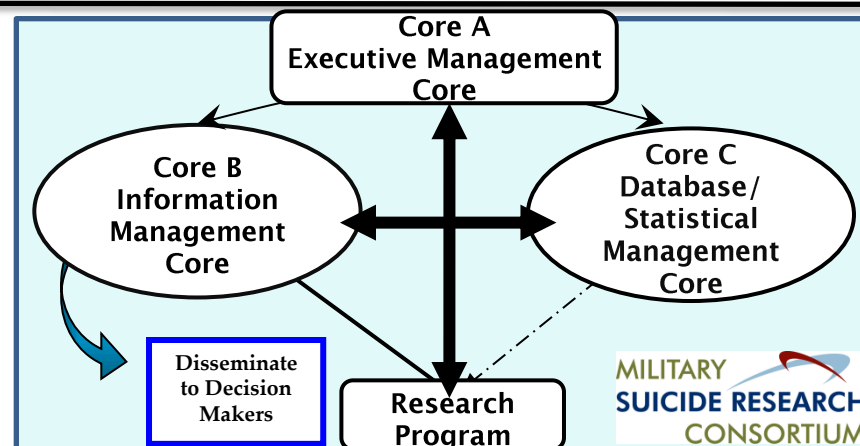
Study/Product Aim(s)

1. Produce new scientific knowledge about suicidal behavior in the military.
2. Use high-quality research methods and analyses to address problems in policy and practice.
3. Disseminate knowledge, information, and findings to those accountable for ensuring the mental health of military personnel.
4. Train future leaders in military suicide research.

Approach

The MSRC's ultimate impact is on suicide prevention in the military, through research (primary, secondary, and tertiary interventions), as well as through information management/scientific communications.

The interrelations between MSRC's cores and the research program increase the dissemination of results, which allow our service men and women to benefit from the new knowledge generated in a more timely fashion.



Accomplishments: The MSRC funded 25 projects and 4 postdoctoral pilot projects, exceeds project timelines, and are good stewards of funding through multiple leveraging efforts. Eleven projects are complete and disseminating the results and products.

Timeline and Cost

Activities	CY11	CY12	CY13	CY14	CY15	CY16
Create infrastructure & establish research priorities						
Review proposed projects & implement research						
Establish pre-doctoral and post-doctoral training opportunities						
Estimated Budget (\$Million)	\$2.2M	\$7.4M	\$7.4M	\$7M	\$6M	(NCE)

Updated: (10/08/2016)

Goals/Milestones

CY11 Goal: Project start-up

- ☑ Create infrastructure & establish research opportunities

CY12 Goals: Implement research projects, establish training opportunities

- ☑ 10 Funded Projects in CY12
- ☑ Offer dissertation awards, training day, & postdoctoral pilot grants

CY13 Goal: Refine research priorities & continue research projects

- ☑ Additional 10 Funded Projects in CY12, total of 20 Funded Studies

CY14 Goal: Start dissemination of studies' findings

- ☑ Present at relevant conferences & develop manuscripts

CY15&16 Goal: Disseminate results of studies & MSRC Common Data Elements

- ☑ Dissemination and implementation of products:
Virtual Hope Box and Cognitive Anxiety Sensitivity Treatment
- ☑ Influence policy, best practices, and programmatic changes:
White papers, Collaboration with DoD, VA, and DSPO

Budget Expenditure to Date

Projected Expenditure: \$30,000,000 (contingent on projects invoicing,
Actual Expenditure: \$27,590,791 (all research funds are designated)

A behavioral sleep intervention for suicidal behaviors in military veterans: A randomized controlled trial

Log Number: 09162006

Award Number: W81XWH-10-2-0178

PI: Bernert (Co-PI Schatzberg) Org: Stanford University (Sites: Stanford University and VA Palo Alto HCS)

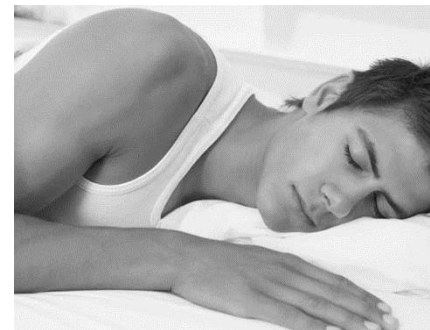


Study Aim

To test the efficacy of a brief behavioral insomnia intervention to prevent suicidal behaviors among military veterans.

Approach

Eligible veterans will receive a brief behavioral insomnia intervention and complete pretreatment and post-treatment assessments, with follow up to two months. Two interventions will be compared to assess post-treatment symptom reductions in suicidal ideation (primary outcome), sleep complaints (secondary outcome), mood and stress indices (exploratory outcome).



Accomplishment: N=63 participants enrolled in clinical trial, of which N=52 (8 groups and 31 individuals) have completed treatment. Contacting local veterans through veteran organization listservs, study cross-referral, targeted local advertising through social media, as well as expanded community and VA flyerling, has led to increased number of new contacts generated, resulting in enhanced recruitment and screening. Preliminary findings support feasibility, tolerability, and safety of the current.

Timeline and Cost

Project Period 9/01/2011-09/30/2016

Activities	CY1	CY2	CY3	CY4	CY5
IRB/VA Approvals, DSMP/DSMB Assembly					
Hire/Train Personnel in Procedures/Protocols					
Manualize Protocols, Prepare Data Collection					
Initiate Recruitment, Initial Screens					
Active Study: Baseline, TX Wks 1-4, Follow-ups					
Quality Control Checks, Process Data Reviews					
Focus Groups for Acceptance, Adherence					
Team Process Reviews for Protocol, Outcomes					
Outcome Data Analysis					
Application for Confirmatory Studies					
Budget	\$218,988	\$322,515	\$429,909		NCE

Goals & Milestones

CY1 Goals

- ✓ Secure Approvals, Organize infrastructure and SOP, Assemble DSMB
- ✓ Create Treatment Materials; Hire & Train Personnel in Study Protocol and Procedures
- ✓ Prepare for Data Collection and Initial Screenings, Initiate Recruitment Strategy

CY2 Goals

- ✓ Initiate Recruitment; Screen, Enroll, and Randomize 76 Eligible Veterans
- ✓ Assemble Study Schedule Among Staff and Study Clinicians; Conduct RCT Data Collection

CY3 Goals

- ✓ Continue Recruitment, Screening, and Enrollment of 76 Eligible Veterans
- ✓ Continue RCT Conduct, Data Collection, and Follow-up Testing

CY4 Goals

- ✓ Continue Recruitment, Screening, and Enrollment of Eligible Veterans
- ✓ Continue RCT Conduct, Data Collection, and Follow-up Testing

CY5 Goals

- ✓ Continue Recruitment, Screening, and Enrollment of Eligible Veterans
- ✓ Continue RCT Conduct, Data Collection, and Follow-Up Testing
- ✓ Conduct Data Analysis, Prepare Publications and Application for Confirmatory Studies

Comments/Challenges/Issues/Concerns

Following the expansion of study criteria to include veterans without current elevated suicide risk, there has been an enhancement in recruitment and enrollment.

Budget Expenditure to Date (as of 08/31/2016)

Projected Expenditure: 1,182,369

Actual Expenditure (to Date, Y5): 1,188,168 (1,155,604 + 32,564 from present quarter)

Updated: October 4, 2016

Toward a Gold Standard for Suicide Risk Assessment for Military Personnel

Award Number: W81XWH-10-2-0178 Log Number: 09162006



PI: Drs. Peter Gutierrez and Thomas Joiner Org: Rocky Mountain MIRECC, Denver VAMC / Florida State University

Study Aims

- Confirm that the four measures are psychometrically sound when used with active duty military personnel.
- Determine which measure is most effective at predicting service members' referral for emergency services due to suicidal crisis or engagement in suicidal behavior within three months of initial assessment.
- Determine if self-report measures perform as well or better than interview-based assessments.
- Determine if combining self-report and interview assessment approaches significantly increases predictive power.

Approach

This study was designed as a 3 month longitudinal study. A total of 700 participants will be recruited from two military installations across the country.



A total of 857 baselines and 539 follow-ups have been completed to date.

Updated: 09/20/16

Timeline and Cost

Activities	CY12	CY13	CY14	CY15	CY16	CY17
Study Start Up						
Start / Continue Data Collection						
Complete Longitudinal Track and Data Analysis						
Estimated Budget (\$K)		\$831,294.24	\$774,868.42	\$771,886.42	NCE	NCE

Goals/Milestones

Year 1 (8/12- 8/13) Goals:

- ☒ Identify sites
- ☒ Complete IRB process
- ☒ Hire, train staff, and conduct site visits

Year 2 (9/13- 8/14) Goals:

- ☒ Begin data collection
- ☒ Begin longitudinal tracking

Years 3 - 5 (9/14- 9/17) Goals:

- ☐ Complete Baseline data collection
- ☐ Finish longitudinal tracking
- ☐ Complete data analysis
- ☐ Draft and disseminate new knowledge

Comments/Challenges/Issues/Concerns

- Experienced delays in obtaining regulatory and Command approvals. Low recruitment at Joint Base Andrews. As a result site has been closed.

Budget Expenditure to Date: Projected Expenditure: \$2,148,085.25

Actual Expenditure: \$1,488,459.97

Warning Signs (WS) and Suicide Attempts

Log #: 09162006; Award #: W81XWH-10-2-0178



Co-PIs: Courtney L. Bagge, PhD, and Kenneth R. Conner, PsyD, MPH;

Organizations: Univ. Mississippi Medical Center; VA VISN 2 Center of Excellence for Suicide Prevention; VA Puget Sound, Seattle, WA; Central Arkansas VA, Little Rock, AK; San Diego VA, San Diego, CA; Univ. Rochester Medical Center

Study/Product Aims: Start date (9/21/13)

Problem: WS define when at acute risk for suicide

- Identification of WS are key to prevention efforts
- Minimal *a priori* research or controlled data on WS

Aims: Identify WS in veterans and civilians

- Categories of WS: behavioral, affective, and cognitive

Specific Hypothesis (based on preliminary studies):

- WS include: rage/anger, anxiety, hopelessness, acute use of alcohol, interpersonal negative life events
- **Military Relevance:** Novel controlled study of WS in military population; Military suicide prevention trainings largely focus on WS; WS are widely disseminated

Methodology: Answering “Why Today?”

Participants:

N=406 suicide attempters

N=110 (from VHA sites); N=296 (from civilian sites)

WS Categories :

Behavioral (e.g., interpersonal event, acute alcohol use)

Affect (e.g., rage/anger, anxiety)

Cognition (e.g., burdensomeness, hopelessness)

WS Measures:

- Timeline Follow-Back (TLFB): Cued Interview
- Self-report

Accomplishment: 363 participants fully completed all assessments. Met recruitment target for full assessments.

Timeline and Total Cost (Direct and Indirect)

Activities	FY 1-3	FY 4
Finalize computerized version of TLFB; Create training materials; Hire and train staff (months 0-8)	<div></div>	
Begin and complete data collection (months 9-36)	<div></div>	
Conduct and complete fidelity and reliabilities of TLFB; Code Original, Fidelity, and Reliability TLFB data (months 35-43)		<div></div>
Variable creation, data comparison and cleaning; Data analysis; manuscript and report writing (month 43-48)		<div></div>
Estimated Total Budget (\$K)	\$1,803,955	\$329,880

Y1 Goals–

- ☐ Create and finalize computerized TLFB (completed)
- ☐ Hire and train staff (completed)
- ☐ Begin data collection (completed)

Y2 & 3 Goals–

- ☐ Continue and finish data collection (completed)
- ☐ Self-report & current hospitalization data cleaned (completed)

Y4 Goals– (in progress; Y4 starts 9/22/16)

- ☐ Continue conducting TLFB fidelities and reliabilities/enter data
- ☐ Coding of Original, Fidelity, and Reliability Data
- ☐ Variables created across Original, Fidelity, and Reliability sets
- ☐ Data cleaned and compared across sets
- ☐ Data analysis; manuscript and report writing

Y1-4 Projected Budget: \$2,133,845; Expenditures: \$1,765,970

Neuroimaging Correlates of Suicide Risk Assessment



Log Number: 09162006

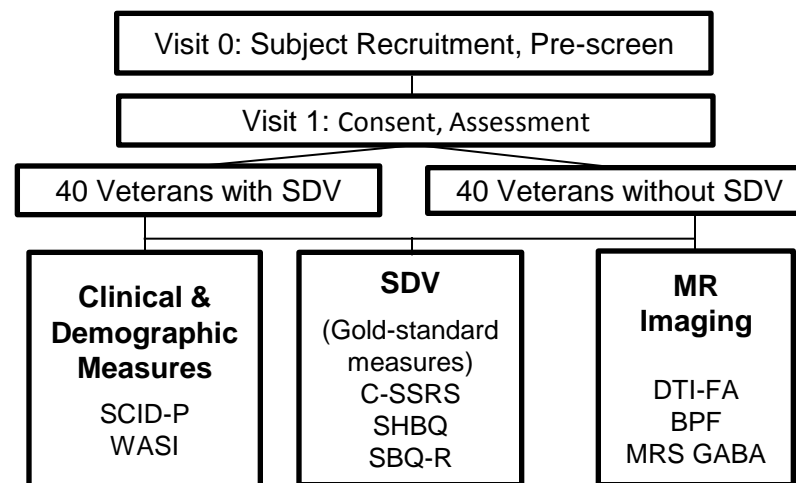
Award Number: W81XWH-10-2-0178

PI: Deborah Yurgelun-Todd, Ph.D.

Org: VISN 19 MIRECC Salt Lake City VA Health Care System;
University of Utah

Problem, Hypothesis and Military Relevance

- Brain changes have been implicated in self-directed violence in returning service men and women. Additional information on neurobiologic changes that may be associated with risk for self-directed violence is needed in order to develop improved intervention and treatment strategies.
- We also hypothesize that significant associations will be present between MR indices and measures of MSRC gold-standard suicide assessments.
- All subjects will complete multimodal neuroimaging (DTI-FA, BPF, MRS-GABA) to measure neurobiological markers of increased risk for self-directed violence as measured by MSRC gold-standard suicide assessments.



Timeline and Total Cost (direct and indirect)

Procedure	0-4 months	5-8 months	9-12 months	13-16 months	17-20 months	21-37 months
IRB Approval						
Subject Recruitment		N=20	N=20	N=20	N=20	
Clinical Assessment & Neuroimaging						
Data Collection & Storage						
Data Analysis & Statistics						
Presentations & Publications						

Updated: October 8, 2016

Goals/ Milestones by Quarter

CY13 Q1—Administrative startup

- ✓ Secure IRB and HRPO approval; finalize protocol; initiate recruitment

CY14 Q2 - Q4—Data acquisition and initial analyses

- ✓ Continue data acquisition; create study database; begin scoring and image analysis; begin data entry

CY15 Q1 - Q4—Continue data acquisition and analyses

- ✓ Continue data acquisition; update scoring and image analysis
- ✓ Complete preliminary analyses and interim presentation

*Received a No Cost Extension August 14, 2015 to extend project to 09/27/2016

CY16 Q1 - Q4—Complete data acquisition and analyses

- ✓ Complete data acquisition
- Finalize hypotheses testing
- Complete final report and publications

Budget Expenditure to Date

Projected Expenditure: \$755,096

Actual Expenditures: \$755,094

A novel approach to identifying behavioral and neural markers of active suicidal ideation: Effects of cognitive and emotional stress on working memory in OEF/OIF/OND Veterans



PI: Beeta Homaifar, PhD & Melissa M. Amick, PhD **Org:** Boston VA Medical Center/Denver VA Medical Center

Study Aims

- 1) To investigate the effect of increasing cognitive and emotional stress on working memory in an active SI group as compared to a non-SI psychiatric control group and a healthy control group.
- 2) To examine the functional integrity and interconnection of the frontal lobes and limbic regions during the most challenging emotionally stressed working memory condition on the EFNBACK task in an active SI group compared to the control groups.
- 3) To evaluate the association between frontal lobe gray matter thickness and amygdala volumes and percent correct responses during the most challenging emotionally stressed working memory condition on the EFNBACK task.




Approach

We will assess the cognitive and neural vulnerabilities through which actively suicidal OEF/OIF/OND Veterans become overtaxed during an experimental task that induces emotional and cognitive stress.

Experimental Groups	Recruitment	Assessment Measures	Dependent measures: f-MRI task/ EFNBACK
Active SI (N=30) Stratified by severity	Primary: TRACTS Secondary: VA Boston Healthcare System Suicide Prevention Program	TRACTS: SCID (GP/CV/IE) TBI-Assessment (GP/CV/IE) CAPS (GP/CV/IE) PROPSAL: BSS (GP) BDI-II (GP) L-SASI (IE) Common Data Elements(GP)	Aim 1: Errors Aim 2: Functional activation and connectivity Aim 3: Gray matter thickness, Volume
Psychiatric Control Group (N=30)			
Non-psychiatric Control Group (N=30)			

GP= Group profile, CV = Confounding variable, IE =inclusion/exclusion

Timeline and Cost

Activities	FY 2014	FY 2015
Phase 1: Build infrastructure, obtain regulatory approval, hire and train personnel, acquire measures, create databases		
Phase 2: Conduct study, Recruit and consent participants, post neuroimaging processing, data entry, data verification		
Phase 3: Data analysis, dissemination, and publication		
Estimated Total Budget (\$648,313)	331,730	316,583

Updated: (10/04/16)

Goals/Milestones

FY 2014 Goals

- ☒ **Obtain regulatory approval:** Boston approved (11/4/14), Denver approved (3/4/14), Denver HRPO approval.
- ☒ **Hire/train personnel:** All staff identified and hired as of 1/6/14
- ☒ **Acquire measures:** All measures collected and in use as of 3/19/14.
- ☒ **Create databases:** Database finished and finalized as of 2/6/14
- ☒ **Recruit participants:** Actively recruiting according to recruitment plan
- ☒ **Collect data:** in progress as participants enroll and participate (n=42)

FY 2015 Goals

- ☒ **Data collection:** in progress
- ☒ **Post neuroimaging processing:** complete for enrolled participants, in progress
- ☒ **Data entry/data checking:** data entered as collected; in progress
- ☐ Dissemination of data
- ☐ Publication/submission of future grant

Budget Expenditure to Date:

Actual: \$538,409

Projected: \$648,313

Home-Based Mental Health Evaluation (HOME): A Multi-Site Interventional Trial

Log Number: 09162006

Award Number: W81XWH-10-2-0178



PI: Bridget Matarazzo, PsyD

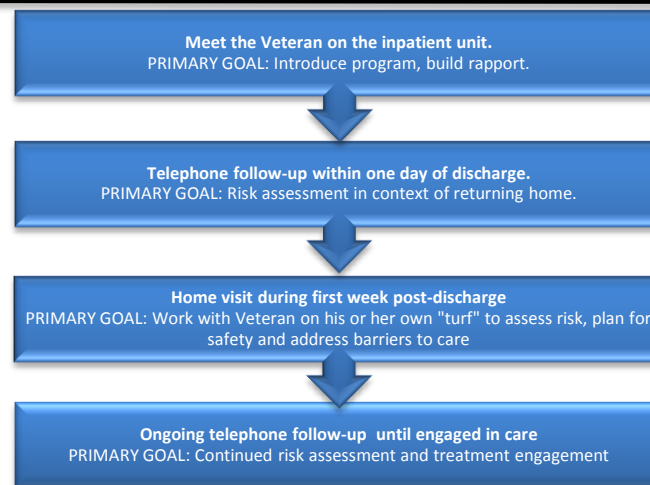
Org: Rocky Mountain MIRECC

Study/Product Aim(s)

- **Primary Hypothesis:** Veterans receiving HOME will be significantly more likely to engage in treatment 3 months post-discharge.
- **Secondary Hypotheses:** Veterans receiving HOME will engage in treatment in a shorter amount of time, attend more appointments and report lower suicidal ideation.

Approach

- The HOME interventional trial aims to answer the following:
 - Question 1: Does the HOME program increase treatment engagement?
 - Question 2: Does the HOME program impact rates of suicidal ideation?
- This project will also explore the association between the following factors and the HOME intervention: mood, suicidal behavior, re-hospitalization, and cost.
- The project aims to accomplish this through a two-arm interventional trial at four Department of Veterans Affairs Medical Centers.



Accomplishment: Full regulatory approval continues to be maintained at all sites. Recruitment concluded as of 4/15/16. As of 07/29/16, all follow-up data has been collected for participants at all sites. Data cleaning and analysis is currently underway.

Timeline and Cost- Project Period 9/21/2013-9/27/2017

Activities	CY13	CY14	CY15	CY16	CY17
Task 1: Prepare for HOME Project Interventional Trial					
Task 2: Conduct HOME Project Interventional Trial					
Task 3: Evaluate and Disseminate HOME Trial					
Estimated Budget (\$1,516,055)	\$51,068	\$384,668	\$544,422	\$479,599	\$56,298

Goals/Milestones

CY13 Goals – Prepare for HOME Project Interventional Trial

- Task 1- Build infrastructure for project

CY14 Goal – Conduct HOME Project Interventional Trial

- Task 2- Recruit and consent participants; collect and enter Time 1 data
- Task 3- Conduct HOME intervention at active sites; collect and enter Time 2 data
- Task 4- Collect and enter Time 3 data
- Task 5- Collect and enter Time 4 data

CY15 & CY16 Goal – Conduct HOME Project Interventional Trial

- Task 2- Recruit and consent participants; collect and enter Time 1 data
- Task 3- Conduct HOME intervention at active sites; collect and enter Time 2 data
- Task 4- Collect and enter Time 3 data
- Task 5- Collect and enter Time 4 data

CY17 Goal – Evaluate and Disseminate HOME Project Interventional Trial

- Task 6- Manage and analyze data
- Task 7- Disseminate findings
- Task 8- Submit final research progress and fiscal reports

Comments/Challenges/Issues/Concerns

- No issues to report and none anticipated for the data cleaning, analysis and dissemination phase.

Budget Expenditure to Date

Projected Expenditure: \$1,516,055

Actual Expenditure: \$1,238,470

Updated: 10/05/2016